

A
T R E A T I S E
O F
P R A C T I C A L A R I T H M E T I C ,
A N D
B O O K K E E P I N G ,
C O N T A I N I N G
A L L T H E R U L E S O F A R I T H M E T I C ,
W H I C H A R E G E N E R A L L Y U S E F U L I N T R A N S A C T I N G B U S I N E S S
W H E R E A R I T H M E T I C I S R E Q U I R E D .
F O R T H E U S E O F S T U D E N T S .

By F. NICHOLS.

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P R E F A C E.



THE principal design of this publication is to furnish young persons of both sexes with a cheap and easy treatise of practical Arithmetic, which shall contain all the rules, with proper examples, that are generally useful in numerical calculations. The next object of attention, was to execute the work in such a manner as to enable a person of a competent age and capacity, who has made a little progress in Arithmetic, to proceed without the help of a master.

The author has availed himself of the assistance which the best treatises of Arithmetic afford; and has endeavoured to render the work concise, clear, and comprehensive. He has always given general rules under each head, and has avoided a multiplicity of cases and notes, which only perplex and confound the learner, and are seldom attended with advantage equal to the trouble of committing them to memory.

Such questions as are usually given in the rules entitled Barter, Loss and Gain, Simple Interest, &c. are here given in the Rule of Three, because they can be resolved by that rule with a little consideration; and therefore a new title seems unnecessary. Another advantage arises from mixing questions of different kinds. When a question is proposed to a learner, who is not perfect in all his rules, he often does not know what rule it belongs to, and perhaps applies a wrong rule. But this expedient will oblige him to exercise his judgment more, and depend less upon his memory.

The rule of Practice is omitted, because it contains so many cases that they cannot be remembered by any person who is not in constant exercise of them; and also because the adoption of the simple and easy method of keeping accounts in federal money will render this rule of little use in mercantile calculations.

Exchange is useful to those who transact business with foreign merchants. To such I recommend a work entitled, *A New System of Mercantile Calculation*. By an Old Merchant. 4to. 1795. This book contains precepts and tables, which render the practice of exchange less difficult and laborious than by the common method.

Fractions

Fractions are placed before the Rule of Three; but those who have not time to learn fractions may omit them and proceed to the Rule of Three, where most of the questions may be resolved without the use of fractions. If the pupil have time, I would advise him to learn fractions; because they serve to abridge numerical calculations, especially the operations in the Rule of Three. Indeed if he intend to learn Mensuration and other parts of Mathematics, whether theoretical or practical, he must previously learn Vulgar and Decimal Fractions.

Under each rule there is a number of examples and solutions, and also a set of questions and answers to exercise the learner. No examples of addition and subtraction of weights and measures are given (except in the appendix), because they are troublesome to beginners, and it was contrary to the plan of the work to discourage the learner and impede his progress by unnecessary difficulties. Most of the questions in the Rule of Three are stated for the purpose of accommodating those who have not a master. Questions and answers only are not a sufficient help to a learner. When he has in vain attempted to solve a question, he is disgusted, despairs of success, and finally concludes that there are difficulties in the common rules of Arithmetic which his genius and industry cannot overcome. In many statings, where it could be done conveniently, the fourth term is expressed in the form of a vulgar fraction, and the expression reduced to lower terms; by which means the operation becomes shorter and easier than by the common method. The Rule of Three is not distinguished into direct and inverse (as is commonly done), but one easy general rule is given whereby all questions, either in whole numbers or fractions, which properly belong to the Rule of Three, may be resolved.

It will be far more convenient and advantageous to the learner to use a printed book, than to employ much time in copying rules and examples. The expense of a book is little in comparison of the loss of time which will otherwise be incurred. I would have the student copy nothing but the operations which he performs on his slate, and not generally those when he is become pretty expert in the management of numbers. 'That which is transcribed is not in the least more appropriated than when it stood in the printed page. It is an error, if any suppose, that by the act of marking the words on paper with a pen, the ideas are more clearly marked on the brain than by attentive reading.' Knox's Essays.

The

The master will find it necessary to give the scholar more examples in the first five rules, than could be inserted in the book without increasing its size too much. Indeed no number of examples in the first rules, that can, with propriety, be inserted in a book, is sufficient for the generality of learners.

That the learner may be furnished with every part of Arithmetic, which is generally useful in the common affairs of life, a short system of Book Keeping is subjoined, exhibiting a specimen of a shop book kept by the method of Single Entry. This specimen is of the simplest and most convenient form, and is fully adequate to the purpose, except perhaps in large concerns, where a form a little different in some respects may be preferable.

E R R A T A.

Page 14 line 10 b (from the bottom) for 7039 read 7089

27 3 for 170 read 670

31 10 for 4 4 read 4 2

34 10 for $3\frac{1}{2}$ read $3\frac{3}{4}$

43 2 b for $\frac{1}{2} \cdot 75$ read $\frac{1}{2} = .75$

55 4 for 900 read 9000

11 for $193\frac{1}{2}$ read $199\frac{1}{2}$

59 17 for 130 read 180

23 for 650 read 250

60 11 for 624 read 924

8 b for $10\frac{1}{2}$ read $10\frac{1}{4}$

62 9 after gain add per cent

14 for 137 11 read 34 5

15 for 42 12 — 6, read 10 13 — 1

64 19 for 7 read 6

65 6 b after 1200 insert :

67 12 for 180 15, read 187 10

13 for 110 5, read 112 10

3 b, 4 b, 5 b, cancel the cents

69 for lines 14, 15, 16, 17 read

$$104\frac{7}{8} : 4\frac{7}{8} :: 760 : \frac{39 \times 760}{839} = 35 \text{ dol } 32\frac{652}{839}c$$

the discount

$$760 \text{ dol} - 35 \text{ dol } 32\frac{652}{839}c = 724 \text{ dol } 67\frac{187}{839}c \text{ the present worth}$$

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A
T R E A T I S E
O F
P R A C T I C A L A R I T H M E T I C .

ARITHMETIC is the art of computing by numbers. The fundamental rules of Arithmetic are *Addition*, *Subtraction*, *Multiplication*, and *Division*; and by the application of these four rules all arithmetical operations are performed.

N O T A T I O N .

ALL numbers may be denoted by these ten figures :
1, 2, 3, 4, 5, 6, 7, 8, 9, 0.
one, two, three, four, five, six, seven, eight, nine, cypher.

There is another value of the figures, which depends upon the place which they hold when joined together, as in the following table.

9	8	7	6	5	4	3	2	1
Hundreds of Millions.	Tens of Millions,	Millions,	Hundreds of Thousands,	Tens of Thousands,	Thousands,	Hundreds,	Tens,	Units,

The figure in the first place, reckoning from the right hand to the left, denotes only its simple value ; the figure in the second place denotes ten times its simple value ; the figure in the third place denotes a hundred times its simple value ; and so on ; the value of any figure, in each successive place, being always ten times greater than its former value. Thus, in the number 1796, the figure 6 in the first place signifies only six ; 9 in the second place signifies nine tens, or ninety ; 7 in the third place, seven hundred ; 1 in the fourth place, one thousand ; and the whole number is read, one thousand seven hundred ninety-six.

The cypher represents nothing of itself ; but when it is annexed to the right hand of other figures, it increases their value in a decuple or ten-fold proportion. Thus 4 signifies only four ; but 40 signifies four tens or forty, and 400 signifies four hundred.

The number 4591 is 4 thousand 5 hundred 91.

210463 is 210 thousand 4 hundred 63.

231427307 is 231 millions 427 thousand 307.

EXPLANATION OF CHARACTERS.

+ signifies *plus* or addition.

— signifies *minus* or subtraction.

× signifies multiplication.

÷ signifies division.

: :: : signifies proportion.

= signifies equality.

∴ signifies therefore.

Thus, $4 + 2$ signifies that 2 is to be added to 4.

$3 - 1$ 1 is to be subtracted from 3.

7×5 7 is to be multiplied by 5.

$6 \div 3$ 6 is to be divided by 3.

$2 : 3 :: 4 : 6$ 2 is to 3 as 4 is 6.

$4 + 2 = 6$ the sum of 4 and 2 is equal to 6.

Also, $3 + 4 \times 2$, or $(3 + 4) \times 2$ signifies that the sum of 3 and 4 is to be multiplied by 2.

ADDITION

ADDITION

IS the collecting of any number of quantities into one quantity equivalent to them all.

Simple Addition is a rule by which we find a number equivalent to several other numbers of the same denomination taken together. The number found by the operation is called the *sum* of the numbers added.

ADDITION TABLE.

2 and 2 are 4	4 and 4 are 8	6 and 6 are 12	9 and 9 are 18
3 5	5 9	7 13	10 19
4 6	6 10	8 14	11 20
5 7	7 11	9 15	12 21
6 8	8 12	10 16	10 and 10 are 20
7 9	9 13	11 17	11 21
8 10	10 14	12 18	12 22
9 11	11 15	7 and 7 are 14	11 and 11 are 22
10 12	12 16	8 15	12 23
11 13	5 and 5 are 10	9 16	12 and 12 are 24
12 14	6 11	10 17	
3 and 3 are 6	7 12	11 18	
4 7	8 13	12 19	
5 8	9 14	8 and 8 are 16	
6 9	10 15	9 17	
7 10	11 16	10 18	
8 11	12 17	11 19	
9 12		12 20	
10 13			
11 14			
12 15			

RULE. Place the numbers to be added one under another, in columns, in such a manner that units may stand under units, tens under tens, hundreds under hundreds, &c. The numbers being thus disposed, draw a line under them. Add together successively all the figures of the same column, beginning with the column of units, and passing successively to the other columns on the left hand. If the sum of the numbers of the same column be expressed by a single figure, place it in that column below the line; but if the sum be expressed by more than one figure, write the figure which stands in

the units' place of the sum in the column proposed, and retain the rest in order that they may be added to the numbers of the next column on the left hand. Repeat the same process successively through all the columns. The total number written below the line is the sum required.

Required the sum of the numbers 5049, 7898, 459.

5049

7898

459

13406 = the sum

I begin at the bottom of the column of units, and say 9 and 8 is 17, 17 and 9 is 26. In 26 there are two tens and 6 over; therefore I set down 6 in the column of units, as you see, and carry 2 to the next column. Then I say 2 and 5 is 7, 7 and 9 is 16, 16 and 4 is 20. In 20 there are just 2 tens; therefore I set down 0 and carry 2 to the next column. And thus I proceed till all the columns be finished.

Required the sum of 458, 98475, 24, 94602.

458

98475

24

94602

193559

Required the sum of 3456,
78904, 230596, 365, 79.

3456

78904

230596

365

79

313400

Required the sum of 8635,
2194, 7421, 5063, 2196,
1245.

Answer 26754

Required the sum of
562163, 21964, 56321,
18536, 4340, 279, 83.

Ans. 663686

SUBTRACTION

IS the taking of a less quantity from a greater, and thereby finding their difference.

Simple Subtraction is a rule whereby we find the difference between two given numbers of the same denomination.

SUBTRACTION

SUBTRACTION TABLE.

2 from 4 and 2 remains	5	3	6 from 12 and 6 remains	13	7
	6	4		14	8
	7	5		15	9
	8	6		16	10
	9	7		17	11
	10	8		18	12
	11	9	7 from 14 and 7 remains	15	8
	12	10		16	9
	13	11		17	10
	14	12		18	11
3 from 6 and 3 remains	7	4		19	12
	8	5	8 from 16 and 8 remains	17	9
	9	6		18	10
	10	7		19	11
	11	8		20	12
	12	9	9 from 18 and 9 remains	19	10
	13	10		20	11
	14	11		21	12
	15	12	10 from 20 and 10 remains	21	11
4 from 8 and 4 remains	9	5		22	12
	10	6	11 from 22 and 11 remains	23	12
	11	7		24	12
	12	8	12 from 24 and 12 remains		
	13	9			
	14	10			
	15	11			
	16	12			
5 from 10 and 5 remains	11	6			
	12	7			
	13	8			
	14	9			
	15	10			
	16	11			
	17	12			

RULE. Place the less number under the greater in such a manner that units may stand under units, tens under tens, &c. and draw a line under the numbers thus disposed. Beginning with the units, and going from the right hand to the left, subtract successively each figure of the lower number from the figure above it, and write the several remainders, as they are found, below the line. If any figure in the lower number be greater than its corresponding figure in the higher number, then add, in your mind, ten to the upper figure, subtract the lower figure from the sum, and write the remainder below the line. Conceive the next figure in the upper number to be diminished by *one*, and proceed as before.

If the work be right the sum of the remainder and less number will be equal to the greater number.

Required the difference between 4967 and 2436.

$$\begin{array}{r} 4967 \\ - 2436 \\ \hline 2531 \end{array} \text{ the difference}$$

Required the difference between 26784 and 8956.

$$\begin{array}{r} 26784 \\ - 8956 \\ \hline 17828 \end{array}$$

I say 6 from 4 I cannot, but 6 from 14 (supposing 10 to be added to 4) and there remains 8, which I set down.— Then, supposing 8 to be diminished by one, I say 5 from 7 and 2 remains, which I set down. 9 from 7 I cannot, but 9 from 17 and 8 remains; 8 from 15 and 7 remains; 0 (nothing) from 1 and 1 remains.

From 3287625

Take 2343756

943869

5327467

1409438

3918029

The sum of two numbers is 1234, and the greater number 987; required the less number. *Ans.* 247

The sum of two numbers is 5623, and the less number 897; required the greater. *Ans.* 4726

MULTIPLICATION

IS the determination of the sum of any given number repeated as many times as there are units in another given number. Simple

Simple Multiplication is an operation by which we find the amount of any given number of one denomination repeated a certain number of times.

The number to be multiplied is called the *multiplicand*; the number by which we multiply is called the *multiplier*; the number which results from the operation is called the *product*. The multiplicand and multiplier are also called terms or factors.

MULTIPLICATION TABLE.

2 times	2 are	4	5 times	5 are	25	10 times	10 are	100
	3	6		6	30		11	110
	4	8		7	35		12	120
	5	10		8	40	11 times	11 are	121
	6	12		9	45		12	132
	7	14		10	50	12 times	12 are	144
	8	16		11	55			
	9	18		12	60			
	10	20	6 times	6 are	36			
	11	22		7	42			
	12	24		8	48			
3 times	3 are	9		9	54			
	4	12		10	60			
	5	15		11	66			
	6	18		12	72			
	7	21	7 times	7 are	49			
	8	24		8	56			
	9	27		9	63			
	10	30		10	70			
	11	33		11	77			
	12	36		12	84			
4 times	4 are	16	8 times	8 are	64			
	5	20		9	72			
	6	24		10	80			
	7	28		11	88			
	8	32		12	96			
	9	36	9 times	9 are	81			
	10	40		10	90			
	11	44		11	99			
	12	48		12	108			

RULE. Place the multiplier under the multiplicand, so that units may stand under units, tens under tens, &c. and draw a line under them. Begin at the right hand, and multiply, successively, every figure in the multiplicand by every figure in the multiplier. Find, as you proceed, how many tens are contained in the product of every two simple numbers, and write the first remainder under the figure by which you multiply, and the other remainders, in order, on the left side of it. To the product of the next two figures add as many units as you retained tens. Proceed thus till you have multiplied by all the figures in the multiplier. Lastly, add all the particular products together; the sum is the whole product required.

Required the product of 3456 multiplied by 3.

3456 multiplicand
3 multiplier

10368 product

I say 3 times 6 are 18, set down 8 and carry 1; 3 times 5 are 15 and 1 carried are 16, set down 6 and carry 1; 3 times 4 are 12 and 1 are 13, set down 3 and carry 1; 3 times 3 are 9 and 1 are 10, which set down.

Multiply 4506
by 45

22530
18024

202770

Multiply 3648
by 743

10944
14592
25536

2710464

Multiply 6987
by 76

41922
48909

531012

Multiply 7039
by 798

56712
63801
49623

5657022

If there be cyphers on the right hand of the numbers proposed, neglect the cyphers, multiply the other figures as before, and annex as many cyphers to the right hand of the product as there are in both factors.

If

ARITHMETIC.

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If there be cyphers in any part of the multiplier, neglect them, multiply by the other figures, and place the first figure of every product under the figure by which you are multiplying.

Multiply 6400 by 340.

$$\begin{array}{r} 64 \\ 34 \\ \hline 256 \\ 192 \\ \hline 217600 \end{array}$$

Multiply 304567 by 50040

$$\begin{array}{r} 1218268 \\ 1522835 \\ \hline 15240532680 \end{array}$$

If the multiplier be the product of two numbers in the table, you may multiply by those two numbers successively.

Multiply 5607 by 35.

$$\begin{array}{r} 5607 \\ 5 \\ \hline 28035 \\ 7 \\ \hline 196245 \end{array}$$

Multiply 7809 by 48.

$$\begin{array}{r} 7809 \\ 6 \\ \hline 46854 \\ 8 \\ \hline 374832 \end{array}$$

$$56078 \times 609 = 34151502$$

$$6780 \times 590 = 4000200$$

$$876 \times 710 = 621960$$

$$6789 \times 63 = 427707$$

$$8907 \times 96 = 855072$$

$$9786 \times 49 = 479514$$

DIVISION

TEACHES to divide a given quantity into any proposed number of equal parts.

Simple Division is an operation by which we find how many times one number is contained in another of the same denomination.

The number to be divided is called the *dividend*; the number by which we divide, the *divisor*; the number which results from the operation, the *quotient*.

RULE. Place the divisor on the left hand of the dividend. Find how many times the divisor is contained in as many figures on the left hand of the dividend as are just necessary,

cessary, and place the number of times on the right hand of the dividend. Multiply the divisor by this number, and place the product under the said figures of the dividend. Subtract this product from that part of the dividend under which it stands, and annex the next figure of the dividend, or more figures if necessary, to the right hand of the remainder. Divide this number, so increased, as before ; and proceed thus till the whole dividend be divided.

If it be necessary to annex more than one figure to the remainder to make it equal to or greater than the divisor, a cypher must be written in the quotient for every figure so annexed, so long as the remainder thus increased continues less than the divisor.

Note. If any product exceed the dividuall (or quantity to be divided) the last quotient figure must be diminished till the product be equal to or less than the dividuall. And if any remainder be equal to or greater than the divisor, the last quotient figure must be increased till the remainder be less than the divisor.

Divide 202770 by 45.

45)202770(4506

180

227

225

270

270

Divide 271195 by 743.

743)271195(365

2229

4829

4458

3715

3715

In the first example I enquire how often 45 is contained in 202, and I find that it is contained 4 times ; therefore I multiply 45 by 4 and place the product under 202, setting the first figure of the product under 2, &c. then I subtract 180 from 202 and place the remainder 22 below. To the remainder I annex the next figure 7 of the dividend, and enquire how oft 45 in 227, &c. as before.

If

If cyphers be annexed to the divisor you may cut them off, and also cut off as many figures on the right hand of the dividend ; then proceed as before. If there be a remainder after the division, place the figures cut off on the right hand of it ; the whole is the true remainder.

Divide 45621 by 360.

$$360 \overline{) 45621} (126$$

36

96

72

242

216

261 remainder

Divide 465076 by 3400.

$$3400 \overline{) 465076} (136$$

34

125

102

230

204

2676

If the divisor do not exceed 12 it will abridge the operation if each figure of the dividend be successively divided by the divisor, reckoning every unit in each remainder 10, and supposing so many tens prefixed to the next figure of the dividend.

Divide 36219 by 3.

$$3 \overline{) 36219}$$

12073 quotient

Divide 234563 by 7.

$$7 \overline{) 234563}$$

33509

In the first example I enquire how often 3 is contained in 3, which is evidently once ; therefore I write 1 under 3. Then I say how oft 3 in 6, twice ; how oft 3 in 2, no times ; how oft 3 in 21, 7 times ; how oft 3 in 9, 3 times. The several quotient figures must be written one after another, as they are found, as you see here.

If the divisor be the product of two numbers in the multiplication table, you may divide by those two numbers successively.

Divide

Divide 196245 by 35.

$$\begin{array}{r} 5 \overline{) 196245} \\ \hline \end{array}$$

$$\begin{array}{r} 7 \overline{) 39249} \\ \hline \end{array}$$

$$5607$$

$$\begin{array}{l} 6741 \div 63 = 107 \\ 40002 \div 59 = 678 \end{array}$$

Divide 374832 by 48.

$$\begin{array}{r} 8 \overline{) 374832} \\ \hline \end{array}$$

$$\begin{array}{r} 6 \overline{) 46854} \\ \hline \end{array}$$

$$7809$$

$$\begin{array}{l} 8550720 \div 960 = 8907 \\ 479514 \div 49 = 9786 \end{array}$$

REDUCTION

TEACHES to convert numbers of one denomination into another, without altering the value.

If the reduction be from a greater to a smaller denomination it is commonly called reduction *descending*; if from a smaller to a greater, reduction *ascending*.

REDUCTION DESCENDING.

RULE. Multiply the highest denomination by as many of the next inferior denomination as make one of the highest. Proceed thus till the given number be reduced as low as the question requires. If the given number be compound, you must add the numbers in each denomination below the highest to the same name, as you proceed in the operation.

REDUCTION ASCENDING.

RULE. Divide the lowest denomination by as many of the same name as make one of the next higher. Proceed thus till the given number be reduced as high as the question requires. The remainders, if any, are of the same denomination as their respective dividend.*

Tables

* The following tables must be committed to memory before the learner proceed to the examples belonging to each table.

Tables of Money, Weights, and Measures.



LAWFUL MONEY.

4 farthings make	1 penny, denoted by d	qrs	d	
12 pence	1 shilling	s	4 = 1	1
20 shillings	1 pound	l	48 = 12 = 1	1
			960 = 240 = 20 = 1	

PENCE TABLES.

d	s	d	s	d
20 make	1	8	2 are	24
30	2	6	3	36
40	3	4	4	48
50	4	2	5	60
60	5		6	72
70	5	10	7	84
80	6	8	8	96
90	7	6	9	108
100	8	4	10	120
110	9	2	11	132
120	10		12	144

FEDERAL MONEY.

10 mills make	1 cent,	denoted by c
10 cents	1 dime	d
10 dimes	1 dollar	dol
10 dollars	1 eagle	E

(mills) m	c	d	dol	E
10 =	1			
100 =	10 =	1	dol	
1000 =	100 =	10 =	1	E
10000 =	1000 =	100 =	10 =	1

TROY

TROY WEIGHT.

24 grains	make 1 pennyweight,	denoted by dwt
20 pennyweights	1 ounce	oz,
12 ounces	1 pound	lb
	gr dwt	
	24 = 1	oz
	480 = 20 = 1	lb
	5760 = 240 = 12 = 1	

By this weight are weighed gold, silver, jewels, and liquors.

AVOIRDUPOIS WEIGHT.

16 drams	make 1 ounce,	denoted by oz
16 ounces	1 pound	lb
28 pounds	1 quarter	qr
4 quarters	1 hundred weight	cwt
20 hundred wt	1 ton	t
	drams oz	
	16 = 1	lb
	256 = 16 = 1	qr
	7168 = 448 = 28 = 1	cwt
	28672 = 1792 = 112 = 4 = 1	t
	573440 = 35840 = 2240 = 80 = 20 = 1	

By this weight are weighed all metals, gold and silver excepted; bread, grain, butter, cheese, flesh, grocery wares, and all articles of a gross nature.

APOTHECARIES WEIGHT.

20 grains	make 1 scruple,	denoted by sc
3 scruples	1 dram	dr
8 drams	1 ounce	oz
12 ounces	1 pound	lb
	gr sc	
	20 = 1	dr
	60 = 3 = 1	oz
	480 = 24 = 8 = 1	lb
	5760 = 288 = 96 = 12 = 1	

Apothecaries

Apothecaries use this weight in compounding their medicines, but buy and sell their drugs by avoirdupois weight.

LONG MEASURE.

12 inches	make	1 foot, denoted by	f
3 feet		1 yard	y
5 yards and a half, or	}	1 rod, pole, or	r
16 feet and a half		perch	fu
40 poles		1 furlong	m
8 furlongs		1 mile	le
3 miles		1 league	

inches	f				
12 =	1	y			
36 =	3	=	1	r	
198 =	16½	=	5½	=	1 fu
7920 =	660	=	220	=	40 = 1 m
63360 =	5280	=	1760	=	320 = 8 = 1

WINE MEASURE.

4 gills	make	1 pint,	denoted by	pt
2 pints		1 quart		qt
4 quarts		1 gallon		gal
63 gallons		1 hoghead		hhd
2 hogheads		1 pipe		p
2 pipes		1 tun		t

pt	qt	gal	hhd	p	t
2 =	1				
8 =	4 =	1	hhd		
504 =	252 =	63 =	1	p	
1008 =	504 =	126 =	2 =	1	t
2016 =	1008 =	252 =	4 =	2 =	1

By this measure are measured all distilled spirits, cyder, oil, vinegar, &c.

ALE AND BEER MEASURE.

2 pints	make	1 quart
4 quarts		1 gallon
36 gallons		1 barrel
54 gallons		1 hoghead
2 hogheads		1 butt
pt	qt	
2 =	1	gal
8 =	4 =	1 bar
288 =	144 =	36 = 1 hhd
432 =	216 =	54 = 1½ = 1 bt
864 =	432 =	108 = 3 = 2 = 1

DRY MEASURE.

8 quarts make	1 peck	qt	p
4 pecks	1 bushel	8 =	1 bus
8 bushels	1 quarter	32 =	8 = 1 qt
		256 =	32 = 8 = 1

T I M E.

60 seconds make	1 minute,	denoted by	'
60 minutes	1 hour		h
24 hours	1 day		d
7 days	1 week		w
4 weeks	1 month		mo
365 days, or }	1 year		y
52 weeks }			
(seconds) 60" =	1' =	h	
3600 =	60 =	1	day
86400 =	1440 =	24	1
31557600 =	525960 =	8766 =	365½ = 1 year
13 mo 1 d 6 h =	52 weeks 1 d 6 h =	365 d 6 h =	1 year.
			Reduce

Reduce 10 E 9 dol 25 c to Reduce 4 l 15 s 10 d to pence.

10 [cents.

109

10

1090

10

10925

20

95

12

1150

Reduce 7 lb 2 oz 15 dwt 23 gr
to grains.

7 lb 2 oz 15 dwt 23 gr

Reduce 2 cwt 3 q 12 lb 10 oz to

4 [ounces.

11

28

100

22

320

16

1930

320

5130

12

86

20

1735

24

6963

3470

41663

Reduce 2 miles 3 fur 45 yds
10 in to inches.

2 m 3 fur 45 yds 10 in

8

Reduce 365 days 6 h 9' 12" to

24 [seconds.

1466

730

8766

60

525969

60

31558152

19

220

425

38

4225

3

12675

12

152110

Reduce

Reduce 12345 cents to eagles.

$$\begin{array}{r} 10 \overline{) 12345} \\ \underline{} \\ \end{array}$$

$$\begin{array}{r} 10 \overline{) 1234-5} \\ \underline{} \\ \end{array}$$

$$\begin{array}{r} 10 \overline{) 123-4} \\ \underline{} \\ \end{array}$$

$$\begin{array}{r} 10 \overline{) 12-3} \\ \underline{} \\ \end{array}$$

Ans. 12 E 3 *dol* 4 *d* 5 *c*

or 123 *dol* 45 *c*

Reduce 732 *l* 17 *s* 2½ to half pence. Ans. 351773

Reduce 703546 farthings to pounds. Ans. 732 *l* 17 *s* 2½ *d*

Reduce 10 *t* 13 *cwt* 3 *q* 21 *lb* 9 *oz* 11 *dr* to drams.

Ans. 2300321

Reduce 6 *lb* 5 *oz* 11 *dwt* 21 *gr* to grains. Ans. 37245

Reduce 76 *t* 3 *bbd* 54 *gal* 7 *pt* of wine to pints. Ans. 155167

Reduce 368145861 drams to tons.

Ans. 641 *t* 19 *cwt* 39 *lb* 12 *oz* 5 *dr*

Reduce 213210 *gr* to *lb*. Ans. 37 *lb* 3 *dwt* 18 *gr*

Reduce 365 days 5 *h* 48' 48" to seconds. Ans. 31556928

Reduce 37 *bar* 5 *gal* of beer to pints. Ans. 10696

Reduce 5 miles 6 *fur* 3 *yds* to inches. Ans. 364428

Reduce 987654 inches to miles.

Ans. 15 *m* 4 *fur* 154 *yds* 2 *f* 6 *in*

Reduce 31556928" to days. Ans. 365 *d* 5 *h* 48' 48"

Reduce 18 *bar* 20 *gal* 4 *pt* of beer to pints. Ans. 5348

Reduce 2674 *pt* of beer to *bar*. Ans. 9 *bar* 10 *gal* 2 *pt*

Federal money is reduced to a lower denomination by annexing one cypher to the given number for every inferior denomination.

Dollars are reduced to cents by annexing two cyphers to the given number.

A compound number consisting of federal money is easily reduced to the lowest denomination by placing the parts one after another, like a simple number; and, on the contrary, federal money is reduced to a higher denomination by separating the figures from the right hand to the left. If there be no dimes in the proposed number, and the cents consist of a single figure, then a cypher must be prefixed to the cents in reduction descending.

To reduce cents to dollars, cut off two figures on the right

right hand. The figures cut off are cents, those on the left hand dollars.

$$\begin{aligned}
 3 \text{ E } 2 \text{ dol } 75 \text{ c} &= 3275 \text{ c} \\
 30 \text{ dol } 25 \text{ c} &= 3025 \text{ c} \\
 4536 \text{ c} &= 45 \text{ dol } 36 \text{ c} = 4 \text{ E } 5 \text{ dol } 36 \text{ c} \\
 23 \text{ dol} &= 2300 \text{ c} \\
 3240 \text{ c} &= 32 \text{ dol } 40 \text{ c} \\
 5 \text{ E } 2 \text{ dol } 6 \text{ c} &= 5206 \text{ c}
 \end{aligned}$$

COMPOUND ADDITION

IS an operation by which we find a number equivalent to several other numbers of different denominations.

RULE. Place the numbers to be added one under another, in columns, in such a manner that the numbers of the same denomination may stand under one another, and draw a line under them. Add together all the figures in the lowest denomination, and find how many units of the next higher denomination are contained in the sum; write the remainder below the line in its proper denomination, and add the units to the figures in the next denomination. Repeat the same process successively through all the denominations, and the sum of the figures in the highest denomination, with the several remainders, will be the sum required.

Required the sum of 2 E 3
dol 15 c, 2 dol 25 c, 4 E 5 dol
52 c, 6 E 7 dol.

E	dol	c
2	3	15
	2	25
4	5	52
6	7	

13 7 92

E	dol	d	c
52	3	4	5
87	8	7	6
36	9	6	4
24	6	5	3
93	4	3	7

295 2 7 5 C 2

Required the sum of 12 E
9 dol 35 c, 25 E 8 dol, 7 E
6 dol 84 c, 7 dol 67 c.

E	dol	c
12	9	35
25	8	
7	6	84
	7	67

47 1 86

dol	c
123	75
36	25
9	35
745	42
68	94

983 75

<i>l</i>	<i>s</i>	<i>d</i>	<i>l</i>	<i>s</i>	<i>d</i>
23	13	6	4	12	11
52	14	7	65	13	10
46	15	8	978	15	9
87	16	9	7	14	7
35	17	10	236	18	5
<hr/>			<hr/>		
246	18	4	1293	15	6

Required the sum of 12 *dol* 15 *c*, 23 *dol* 24 *c*, 263 *dol* 13 *c*, 75 *dol* 65 *c*, 3 *dol*, 2 *dol* 75 *c*. *Ans.* 379 *dol* 92 *c*

A owes B 9 *l* 6 *s* 3 *d*, 4 *l* 3 *s*, 5 *l* 9 *s* 10 *d*, 18 *s* 6 *d*, 75 *l* 15 *s* 5 *d*, 53 *l* 12 *s* 11 *d*. Required the debt.

Ans. 149 *l* 5 *s* 11 *d*

COMPOUND SUBTRACTION

IS an operation by which we find the difference between two numbers of different denominations.

RULE. Place the less number under the greater, so that the parts which are of the same name may stand under one another, and draw a line under them. Begin with the lowest denomination, and subtract each number in the lower line from that above it, and write the several remainders, as they are found below the line. If any number in the lower line be greater than its corresponding number in the upper line, increase the upper number by as many as make an unit of the next higher denomination; subtract the lower number from the upper so increased, and set down the remainder. Conceive the next number in the upper line to be diminished by one, and proceed as before. The several remainders taken together will be the whole difference required.

<i>dol</i>	<i>c</i>	<i>E</i>	<i>dol</i>	<i>d</i>	<i>c</i>	<i>l</i>	<i>s</i>	<i>d</i>
25	50	12	3	6	7	31	12	3
19	75	10	3	6	8	18	13	5
<hr/>		<hr/>		<hr/>		<hr/>		
5	75	1	9	9	9	12	18	10

A owes B 35 *dol* 25 *c*, 7 *dol* 65 *c*, 49 *dol* 75 *c*, 129 *dol* 40 *c*. B owes A 27 *dol* 20 *c*, 123 *dol*, 83 *dol* 28 *c*. To whom is the balance due, and how much?

Ans. Balance due to A 11 *dol* 43 *c*
A person

A person failing has property to the amount of 1086 *l* 15*s*, and owes the following sums: 360 *l* 10*s*, 67 *l* 15*s*, 480 *l*, 59 *l* 8*s*, 80 *l*, 170 *l*, 220 *l* 12*s*. Required the deficiency.
Ans. 851 *l* 10*s*

COMPOUND MULTIPLICATION

TEACHES to find the amount of any number consisting of different denominations repeated a certain number of times.

RULE. If the multiplier or given number be the product of two numbers in the multiplication table, multiply the compound number by one of those numbers, and the product by the other, beginning at the lowest denomination of the multiplicand, and carrying as in compound addition.

If the multiplier be not contained in the table, find the nearest number to it in the table, either greater or less; multiply successively by the two component parts of that number, and to or from the product add or subtract the product of as many as it is less or greater than the given number.

If the multiplier exceed any number in the table, reduce the multiplicand to the lowest denomination in it; then multiply it so reduced as in simple multiplication, and reduce the product to any higher denomination required.

If the price of any thing be in federal money, reduce the different denominations to the lowest denomination; then multiply as in simple multiplication, and reduce the product to any higher denomination.

Required the price of 6 *lb* of tea at 8*s* 6*d* per *lb*.

6

2 11 0

I say 6 times 6 = 36; 36 *d* = 3*s*; set down 0 and carry 3. 6 times 8 = 48, and 3 are 51; 51 *s* = 2 *l* 11*s*. So the price is 2 *l* 11*s*.

16 yards

16 yards of cloth at
18 s 6 d.

$$\begin{array}{r}
 18 \quad 6 \\
 \quad 4 \\
 \hline
 3 \quad 14 \quad 0 \\
 \quad 4 \\
 \hline
 18 \quad 16
 \end{array}$$

19 firkins of butter at 1 l
15 s 6 d.

$$\begin{array}{r}
 1 \quad 15 \quad 6 \\
 \quad 6 \\
 \hline
 10 \quad 13 \quad 0 \\
 \quad 3 \\
 \hline
 31 \quad 19 \\
 \quad 1 \quad 15 \quad 6 \\
 \hline
 33 \quad 14 \quad 6
 \end{array}$$

572 bushels of wheat
at 6 s 9 d.

$$\begin{array}{r}
 572 \\
 6 \text{ s } 9 \text{ d} = 81 \text{ d} \\
 \hline
 572 \\
 4576 \\
 \hline
 12)46332 \\
 \hline
 20)3861
 \end{array}$$

356 barrels of flour at 3 l
12 s.

$$\begin{array}{r}
 356 \\
 3 \text{ l } 12 \text{ s} = 72 \text{ s} \\
 \hline
 712 \\
 2492 \\
 \hline
 20)25632 \\
 \hline
 1281-12
 \end{array}$$

Ans. 193 l 1 s 193-7

432 gal of wine at 1 dol 50 c.

$$\begin{array}{r}
 432 \\
 1 \text{ dol } 50 \text{ c} = 150 \text{ c} \\
 \hline
 21600 \\
 432 \\
 \hline
 4800 = 648 \text{ dol}
 \end{array}$$

345 at 2 dol 3 d 4 c.

$$\begin{array}{r}
 2 \text{ dol } 3 \text{ d } 4 \text{ c} = 234 \text{ c} \\
 345 \\
 \hline
 1170 \\
 936 \\
 702
 \end{array}$$

80730 =
807 dol 30 c = 80 E 7 dol 3 d

512 bushels

ARITHMETIC.

29

5 bales of goods, each weighing 17 cwt 3 q 23 lb

17 cwt 3 q 23 lb

5

89 3 3

6 parcels, each weighing

21 lb 11 oz 15 dr.

6

130 7 10

Answers

7 gallons of brandy
9 cyder
12 wine
17 porter
24 yards of linen
31 cotton
38 cloth
46 lb of sugar
57 tea
63 coffee
75 butter
89 bread
96 cheese
112 raisins
140 tobacco
165 bushels of wheat
234 apples
3456 corn

	s	d	l	s	d
at 7	6	6 $\frac{1}{2}$	2	12	6
				4	10 $\frac{1}{2}$
	5	6	3	6	
	3	4	2	16	8
	3	6	4	4	
	1	3	1	18	9
	15	9	29	18	6
	1	8	3	16	8
	8	4	23	15	
	1	6	4	14	6
	1	4	5		
		4 $\frac{1}{2}$	1	13	4 $\frac{1}{2}$
		9	3	12	
		10	4	13	4
		9	5	5	
	6	3	51	11	3
	4	2	48	15	
	4	8	806	8	

76
85
96
234
567

	dol	c	dol	c
at 5	50	418		
	3	75	318	75
	4	25	408	
	8	20	1918	80
	10	50	5953	50

COMPOUND

COMPOUND DIVISION

TEACHES to divide a number of different denominations into any proposed number of equal parts.

RULE. Place the numbers as in simple division. Begin at the highest denomination, and divide each denomination successively by the divisor. If there be a remainder reduce it to the next lower denomination, and to it add the number which is in that denomination; then divide the sum as before.

If the divisor be the product of two numbers in the multiplication table, divide successively by those two numbers.

If 6 lb of tea cost 2 l 11 s, what is the price of 1 lb?

$$\begin{array}{r} \text{l} \quad \text{s} \\ 6)2 \quad 11 \end{array}$$

o 8 6 *Ans.*

I reduce 2 l 11 s to shillings, and then say, how often 6 in 51; 8 times 6 = 48, and 3 over. 3 s = 36 d; how often 6 in 36; 6 times 6 = 36. So the answer is 8 s 6 d.

If 16 yards of cloth cost 14 l 16 s, what is the price of 1 yard?

$$4)14 \quad 16$$

$$4)3 \quad 14$$

o 18 6

If 26 gallons of wine cost 39 dol, what is the price of 1 gallon?

$$26)39(1$$

26

13

100

$$26)1300(50$$

130

o

Ans. 1 dol 50 c

If 36 bushels of wheat cost 52 dol 20 c, what is the price of 1 bushel?

$$6)5220$$

$$6)870$$

145 = 1 dol 45 c

If 19 firkins of butter cost 45 l 2 s 6 d, what is the price of 1 firkin?

$$19)45 \quad 2 \quad 6(2$$

38

7

20

$$19)142(7$$

133

9

12

$$19)114(6$$

114

Ans. 2 l 7 s 6 d

If

				<i>Answers</i>			
				<i>l</i>	<i>s</i>	<i>d</i>	
If 7 gal of brandy cost	2	5	6	what is 1?	6	6	
12 wine	3	6			5	6	
18 cyder		9	9			6	$\frac{1}{2}$
27 lb of beef		15	9			7	
30 butter	1	15			1	2	
45 sugar	3	15			1	8	
56 tea	23	6	8		8	4	
29 cwt of cheese	79	15		2	15		
17 hops	89	5		5	5		
32 buf of apples	6	13	4		4	4	
23 wheat	8	12	6		7	6	
26 rye	6	1	4		4	8	

				<i>dol</i>	<i>c</i>
If 76 cost	418		what is the price of 1?	5	50
85	318	75		3	75
234	1918	80		8	20

COMMON MEASURE.

THE *common measure* of two or more numbers is that number which will divide each of them without a remainder. Thus, 5 is the common measure of 15, 20, 30. The greatest number that will divide two or more numbers is called their *greatest common measure*. Thus, 4 is the greatest common measure of 8 and 12.

If 1 be the greatest common measure of the given numbers, they are said to be *prime* to one another, or *incommensurable*.

To find the greatest common measure of two or more numbers.

If there be two numbers only, divide the greater number by the less; then divide the divisor by the remainder. Continue to divide the last divisor by the last remainder till there be no remainder. The last divisor is the greatest common measure.

When

When there are more numbers than two, find the greatest common measure of two of them, as above; then find the g. c. m. of that common measure and of one of the other numbers, and so on through all the numbers. The g. c. m. last found is that required.

Required the g. c. m. of 612 and 540.

540)612(1

540

72)540(7

504

36)72(2

72

Ans. 36

Required the g. c. m. of 918, 1998, 522.

The g. c. m. of 918 and 1998 is 54; and the g. c. m. of 54 and 522 is 18. Therefore 18 is the g. c. m. required.

Required the g. c. m. of 246 and 372.

Ans. 6

VULGAR FRACTIONS.

FRACTIONS, or broken numbers, are expressions for any assignable parts of an unit, or whole number; and are represented by two numbers placed one above the other and separated by a line drawn between them. Thus, $\frac{2}{3}$ denotes two thirds of any thing, $\frac{5}{7}$ denotes five sevenths of any thing.

The figure above the line is called the *numerator*, the figure below the line the *denominator*. The denominator indicates the number of parts into which the unit is divided, and the numerator expresses the number of those parts which are designed by the fraction. The numerator and denominator are sometimes called the *terms* of a fraction.

If the numerator be less than the denominator, the fraction is called *proper*, as $\frac{1}{2}$; if greater, *improper*, as $\frac{4}{3}$.

A *compound* fraction is the fraction of a fraction, as $\frac{1}{2}$ of $\frac{2}{3}$.

A *mixed* number consists of a whole number and a fraction, as $1\frac{1}{2}$.

A fraction

A fraction is said to be in its least or lowest terms when it is expressed by the least numbers possible.

Any whole number may be expressed like a fraction by writing 1 under it.

The value of a fraction is increased by increasing the numerator, and the contrary ; and diminished by increasing the denominator, and the contrary.

REDUCTION OF VULGAR FRACTIONS

IS the conversion of them from one form into another.

1. To abbreviate or reduce a fraction to its lowest terms.

Divide the terms of the given fraction by any number that will divide them without a remainder ; divide the quotients by any number that will divide them without a remainder.— Proceed thus till there is no number greater than 1 which will divide them. The last quotients will be the least terms of the fraction required. Or, divide the terms of the given fraction by their greatest common measure, and the quotients will be the least terms of the fraction required.

$\frac{72}{120} = \frac{3}{5}$ by dividing by 5.

$$\begin{array}{ccccccc} (2) & (3) & (2) & (2) & & & \\ \frac{72}{120} & = & \frac{36}{60} & = & \frac{12}{20} & = & \frac{6}{10} = \frac{3}{5} \end{array}$$

Otherwise. $72 \overline{)120}(1$

$$\begin{array}{r} 72 \\ \hline \end{array}$$

$$\begin{array}{r} 48 \overline{)72}(1 \\ \hline \end{array}$$

$$\begin{array}{r} 48 \\ \hline \end{array}$$

$$\begin{array}{r} 24 \overline{)48}(2 \\ \hline \end{array}$$

$$\begin{array}{r} 48 \\ \hline \end{array}$$

$$\text{Then } \frac{(24) 72}{120} = \frac{3}{5}$$

$$\begin{array}{l} \frac{96}{544} = \frac{3}{17} \\ = \frac{1}{8} \end{array} \quad \begin{array}{l} \frac{192}{576} = \frac{1}{3} \\ = \frac{46}{184} = \frac{1}{4} \end{array} \quad \frac{825}{960} = \frac{55}{64} \quad \frac{57}{456}$$

2. To reduce a mixed number to its equivalent improper fraction. D Multiply

Multiply the whole number by the denominator of the fraction ; add the numerator to the product, and under the sum place the denominator.

$$3\frac{1}{3} = \frac{3 \times 3 + 1}{3} = \frac{10}{3} \quad 15\frac{1}{5} = \frac{15 \times 5 + 1}{5} = \frac{76}{5}$$

$$= \frac{78}{5} \quad 36\frac{1}{8} = \frac{293}{8} \quad 514\frac{1}{8} = \frac{8229}{8}$$

3. To reduce an improper fraction to its equivalent whole or mixed number.

Divide the numerator by the denominator, and place the denominator under the remainder (if any).

$$\frac{11}{3} = 11 \div 3 = 3\frac{1}{3} \quad \frac{78}{5} = 78 \div 5 = 15\frac{3}{5}$$

$$\frac{45}{5} = 9 \quad \frac{293}{8} = 36\frac{5}{8} \quad \frac{8229}{16} = 514\frac{5}{16}$$

4. To reduce a compound fraction to an equivalent simple fraction.

Multiply all the numerators together, and all the denominators, and place the latter product under the former.

If part of the compound fraction be a whole or mixed number, it must be reduced to a fraction.

If any two terms of the compound fraction can be divided by the same number, they may be divided by that number, and the quotients used instead of them.

$$\frac{1}{2} \text{ of } \frac{2}{3} \text{ of } \frac{3}{4} \text{ of } \frac{4}{5} \text{ is } = \frac{1 \times 2 \times 3 \times 4}{2 \times 3 \times 4 \times 5} = \frac{1}{5}$$

$$\frac{2}{3} \text{ of } \frac{3}{4} \text{ of } \frac{8}{11} \text{ is } = \frac{2 \times 3 \times 8}{3 \times 4 \times 11} = \frac{4}{11}$$

$$\frac{3}{4} \text{ of } \frac{4}{5} \text{ of } \frac{5}{6} \text{ of } \frac{11}{12} \text{ is } = \frac{3 \times 4 \times 5 \times 11}{4 \times 5 \times 6 \times 12} = \frac{11}{2 \times 12} = \frac{11}{24}$$

$$\frac{1}{4} \text{ of } \frac{1}{2} \text{ of } \frac{3}{4} \text{ of } 12\frac{1}{2} = \frac{1 \times 1 \times 3 \times 25}{4 \times 2 \times 4 \times 2} = \frac{75}{64}$$

5. To reduce fractions of different denominators to equivalent fractions having a common denominator.

Multiply

Multiply each numerator into all the denominators, except its own denominator ; multiply all the denominators together, and place the product under each of the former products.

Reduce $\frac{3}{4}$ and $\frac{5}{6}$ to equivalent fractions having a common denominator.

$$3 \times 6 = 18 \text{ the new numerator for } \frac{3}{4}$$

$$5 \times 4 = 20 \text{ } \underline{\hspace{2cm}} \frac{5}{6}$$

$$4 \times 6 = 24 \text{ the common denominator.}$$

Therefore the new equivalent fractions are $\frac{18}{24}$ and $\frac{20}{24}$, or $\frac{3}{4}$ and $\frac{5}{6}$.

$\frac{1}{4}$, $\frac{2}{7}$, $\frac{5}{8}$ are respectively equivalent to $\frac{40}{280}$, $\frac{64}{280}$, $\frac{100}{280}$.

$\frac{1}{2}$, $\frac{2}{3}$ of $\frac{3}{8}$, $1\frac{1}{2}$ are respectively equivalent to $\frac{12}{24}$, $\frac{6}{24}$, $\frac{36}{24}$, or $\frac{1}{2}$, $\frac{2}{3}$, $1\frac{1}{2}$.

Note. If the denominators of two fractions have a common measure, divide them by their greatest common measure ; then multiply the terms of each fraction by the quotient which results from the division of the denominator of the other by the greatest common measure, and the fractions will be expressed in lower terms than by the general rule.

Reduce $\frac{2}{9}$ and $\frac{5}{6}$ to a com. den.

The g. c. m. of 9 and 6 is 3, and the quotients of 9 and 6 divided by 3 are 3 and 2 ; $\therefore \frac{2}{9} = \frac{2 \times 2}{9 \times 2} = \frac{4}{18}$, and

$$\frac{5}{6} = \frac{5 \times 3}{6 \times 3} = \frac{15}{18} ; \therefore \text{the fractions become } \frac{4}{18} \text{ \& } \frac{15}{18}.$$

Reduce $\frac{7}{9}$ and $\frac{4}{15}$ to a com. den.

The g. c. m. of 9 and 15 is 3 ; $\therefore \frac{7}{9} = \frac{7}{3}$, and $\frac{4}{15} = \frac{4}{5}$.

Reduce $\frac{3}{4}$ and $\frac{7}{8}$ to a com. den. Ans. $\frac{6}{8}$ and $\frac{7}{8}$

6. To reduce a fraction of one denomination to a fraction of another which shall be of the same value.

Multiply the numerator or denominator of the proposed fraction by the parts of the denominations between it and the required denomination, according as the reduction is to a less or greater denomination.

Reduce

Reduce $\frac{1}{4}$ of a penny to the fraction of a pound.

$$\frac{5}{6} \times \frac{1}{12} \times \frac{1}{20} = \frac{5}{1440} = \frac{1}{288} l$$

Reduce $\frac{1}{144} l$ to the fraction of a penny.

$$\frac{1}{288} \times 20 \times 12 = \frac{240}{288} = \frac{5}{6} d$$

Reduce $\frac{1}{4} d$ to the fraction of $1 l$.

$$\text{Ans. } \frac{1}{108} l$$

Reduce $\frac{1}{4} l$ to the fraction of $1 d$.

$$\text{Ans. } \frac{1}{4} l = 102 \frac{1}{2} d$$

Reduce $\frac{1}{4}$ of a cent to the fraction of an eagle.

$$\frac{3}{5} \times \frac{1}{100} \times \frac{1}{10} = \frac{3}{5000} E$$

Reduce $\frac{1}{3}$ of an eagle to the fraction of a cent.

$$\frac{2}{3} \times 10 \times 100 = \frac{2000}{3} = 666 \frac{2}{3} c$$

Reduce $\frac{1}{4}$ of a dollar to the fraction of a cent.

$$\text{Ans. } \frac{1}{4} d = 33 \frac{1}{2} c$$

$$\frac{1}{4} \text{ oz avoird} = \frac{1}{16} lb \quad \frac{1}{4} \text{ dw} = \frac{1}{160} lb \text{ troy} \quad \frac{1}{16} \text{ cwt} = \frac{1}{16} lb$$

Note. If a compound whole number be proposed, reduce it to the lowest denomination in it, and proceed as before.

Reduce $2 s 6 d$ to the fraction of $1 l$.

$$2 s 6 d = 30 d = \frac{30}{1} \times \frac{1}{12} \times \frac{1}{20} = \frac{1}{8} l$$

Reduce $3 q 14 lb$ to the fraction of $1 cwt$.

$$3 q 14 lb = \frac{98}{1} lb = \frac{98}{112} = \frac{7}{8} cwt$$

Reduce $1 s 2 \frac{1}{2} d$ to the fraction of $1 l$.

$$1 s 2 \frac{1}{2} d = 14 \frac{1}{2} d = \frac{59}{4} \times \frac{1}{12} \times \frac{1}{20} = \frac{59}{960} l$$

7. To find the value of a fraction in numbers of inferior denominations.

Multiply

Multiply the numerator by the next inferior denomination, and divide the product by the denominator. Multiply the remainder (if any) by the next inferior denomination, and divide by the denominator. The several quotients will be the value required.

Required the value of $\frac{3}{4} l$:

Required the value of $\frac{3}{4} E$:

$$\begin{array}{r} 2 \\ 20 \\ \hline 3)40 \end{array}$$

$$\begin{array}{r} 2 \\ 10 \\ \hline 9)20 \end{array}$$

$$\begin{array}{r} 13 \\ 12 \\ \hline 3)12 \\ \hline 4 \end{array}$$

Ans. 13 s 4 d

$$\begin{array}{r} 2 \\ 100 \\ \hline 9)200 \\ \hline 22 \end{array}$$

Ans. 2 dol 22 $\frac{2}{3}$ c

Required the value of $\frac{15}{16}$ dol in cents, and also in shillings and pence.

$$\frac{15}{16} \text{ dol} = \frac{1500}{16} c = 93 \frac{1}{2} c$$

$$\frac{15}{16} \text{ dol} = \frac{15}{16} \times 6 = \frac{45}{8} s = 5 \frac{5}{8} s = 5 s 7 \frac{1}{2} d$$

$$\frac{3}{4} l = 12 s$$

$$\frac{1}{4} E = 7 \text{ dol } 50 c$$

$$\frac{5}{8} l = 12 s 6 d$$

$$\frac{1}{8} \text{ of } 105 E = 46 E 8 \text{ dol } 75 c$$

$$\frac{3}{8} s = 4 \frac{1}{2} d$$

$$\frac{1}{4} \text{ lb troy} = 7 \text{ oz } 4 \text{ dwt}$$

$$\frac{3}{4} \text{ cwt} = 2 \text{ q } 18 \text{ lb } 10 \frac{3}{4} \text{ oz}$$

$$\frac{1}{4} \text{ year} = 6 \text{ w } 3 \text{ d } 12 \text{ h}$$

$$\frac{7}{8} \text{ tun} = 3 \text{ bbl } 31 \text{ gal } 2 \text{ qt}$$

$$\frac{2}{3} \text{ ton} = 4 \text{ lb } 8 \text{ oz}$$

$$\frac{1}{2} \text{ mile} = 6 \text{ fur } 26 \text{ p } 11 \text{ f}$$

$$\frac{1}{2} \text{ bar} = 3 \text{ gal } 2 \text{ qt}$$

$$\frac{1}{2} \text{ day} = 4 \text{ h } 20'$$

$$\frac{5}{8} \text{ yard} = 2 \text{ f } 8 \text{ in}$$

A ship, estimated at 2000 E, is to be divided equally among 500 persons. Required the value of $\frac{3}{5}$ of one share.

$$\frac{2000}{500} = 4 \text{ E} = 1 \text{ share}, \therefore \frac{3}{5} \times 4 = 2 \text{ E } 4 \text{ dol}$$

ADDITION OF VULGAR FRACTIONS.

REDUCE compound fractions to single fractions, mixed numbers to improper fractions, and fractions of different denominations to fractions of the same denomination; and lastly, reduce all the fractions to a common denominator; then add all the numerators together, and under the sum place the common denominator.

Required the sum of $\frac{1}{2}$ and $\frac{1}{3}$.

$$\begin{array}{r} 1 \times 3 = 3 \\ 2 \times 2 = 4 \\ 2 \times 3 = 6 \\ \hline 3 + 4 = 7 \\ 6 \qquad 6 = 1\frac{1}{6} \end{array}$$

Required the sum of $\frac{4}{7}$, $7\frac{1}{2}$, $\frac{3}{5}$ of $\frac{1}{2}$.

$$\begin{array}{r} \frac{4}{7} + 7\frac{1}{2} + \frac{3}{5} \times \frac{1}{2} = \\ \frac{4}{7} + \frac{15}{2} + \frac{3}{10} = \\ \hline 8 + \frac{75}{10} + \frac{3}{10} = \frac{88}{10} = 8\frac{4}{5} \end{array}$$

Required the sum of $\frac{1}{20}$, $\frac{2}{3}$, $\frac{5}{6}$. *Ans.* $1\frac{17}{60}$

Required the sum of $2\frac{1}{2}$, $\frac{1}{3}$, $\frac{2}{5}$. *Ans.* $3\frac{11}{30}$

Required the sum of $\frac{1}{3}$ dol and $\frac{2}{5}$ c.

$$\frac{1}{3} \text{ dol} + \frac{2}{5} \text{ c} = \frac{100}{3} \text{ c} + \frac{2}{5} \text{ c} = \frac{112}{15} \text{ c} = 34\frac{2}{3} \text{ c}$$

Required the sum of $\frac{1}{12}$ E, $\frac{1}{8}$ dol, $\frac{1}{3}$ c.

$$\begin{array}{l} \frac{1}{12} \text{ E} = \frac{1000}{12} \text{ c}, \quad \frac{1}{8} \text{ dol} = \frac{100}{8} \text{ c}; \therefore \frac{1000}{12} + \frac{100}{8} + \\ \frac{1}{3} = \frac{250}{3} + \frac{25}{2} + \frac{1}{3} = \frac{500 + 75 + 2}{6} = \frac{577}{6} \\ = 96\frac{1}{6} \text{ c} \end{array}$$

Required

Required the sum of $\frac{3}{7}l$, $\frac{2}{5}s$, $\frac{1}{2}d$.

$$\frac{3}{7}l = \frac{3 \times 20 \times 12}{7}d, \frac{2}{5}s = \frac{2 \times 12}{5}d; \therefore \frac{3 \times 20 \times 12}{7} + \frac{2 \times 12}{5} + \frac{1}{2} = \frac{7571}{70} = 108\frac{11}{70}d = 9s \frac{11}{70}d$$

Required the sum of $\frac{3}{7}l$ and $\frac{5}{9}s$. *Ans.* $13s 10\frac{1}{7}d$

Required the sum of $\frac{1}{3}$ of a day, $\frac{2}{3}$ of an hour, $\frac{1}{15}$ of a minute. *Ans.* $9h 50' 5''$

Required the sum of $\frac{1}{2}lb$ and $\frac{1}{4}oz$. *Ans.* $12oz 10dr$

SUBTRACTION OF VULGAR FRACTIONS.

REDUCE the fractions as in addition; subtract the less numerator from the greater, and place the difference of the numerators over the common denominator.

Required the difference between $\frac{2}{3}$ and $\frac{1}{5}$.

$$\left. \begin{array}{l} 2 \times 5 = 10 \\ 3 \times 3 = 9 \\ 3 \times 5 = 15 \end{array} \right\} \therefore \frac{10-9}{15} = \frac{1}{15}$$

Required the difference between $2\frac{1}{3}$ and $1\frac{1}{4}$.

$$2\frac{1}{3} - 1\frac{1}{4} = \frac{11}{5} - \frac{11}{7} = \frac{77-55}{35} = \frac{22}{35}$$

From 1 take $\frac{1}{4}$. *Ans.* $\frac{3}{4}$

From $\frac{1}{2}$ of $\frac{1}{3}$ take $\frac{1}{15}$. *Ans.* $\frac{1}{6}$

From $\frac{3}{8}dol$ take $\frac{9}{10}c$.

$$\frac{3}{8}dol - \frac{9}{10}c = \frac{300}{8}c - \frac{9}{10}c = \frac{1500-36}{40} = \frac{1464}{40} = \frac{183}{5} = 36\frac{3}{5}c$$

From

From $\frac{3}{4}$ lb avoird take $\frac{2}{3}$ oz.

$$\frac{3}{5} \text{ lb} - \frac{2}{3} \text{ oz} = \frac{48}{5} \text{ oz} - \frac{2}{3} \text{ oz} = \frac{134}{15} = 8\frac{4}{15} \text{ oz}$$

From $\frac{5}{12}$ l take $\frac{4}{9}$ d.

$$\frac{5}{12} \text{ l} - \frac{4}{9} \text{ d} = \frac{5 \times 20 \times 12}{12} \text{ d} - \frac{4}{9} \text{ d} = 100 - \frac{4}{9} =$$

$$\frac{900 - 4}{9} = \frac{896}{9} = 99\frac{5}{9} \text{ d} = 8 \text{ s } 3\frac{5}{9} \text{ d}$$

From $\frac{1}{4}$ oz take $\frac{1}{7}$ dwt. *Ans.* 11 dwt 3 gr

From $\frac{2}{3}$ of a yard take $\frac{1}{6}$ of an inch. *Ans.* $23\frac{4}{9}$ in

MULTIPLICATION OF VULGAR FRACTIONS.

REDUCE compound fractions to single fractions, and mixed numbers to improper fractions; then multiply all the numerators together, and all the denominators; and place the product of the numerators over that of the denominators.

Required the product of $\frac{4}{7}$ and $\frac{3}{5}$. $\frac{4}{7} \times \frac{3}{5} = \frac{12}{35}$

Required the product of $\frac{2}{3}$, $\frac{3}{4}$, $\frac{6}{7}$. $\frac{2}{3} \times \frac{3}{4} \times \frac{6}{7} = \frac{3}{7}$

Required the product of $3\frac{1}{4}$ and $2\frac{3}{7}$.

$$3\frac{1}{4} \times 2\frac{3}{7} = \frac{13}{4} \times \frac{12}{5} = \frac{13}{1} \times \frac{3}{5} = \frac{39}{5} = 7\frac{4}{5}$$

Required the product of $\frac{2}{3}$, $3\frac{1}{4}$, 2 , $\frac{3}{5}$ of $\frac{5}{6}$.

$$\frac{2}{3} \times 3\frac{1}{4} \times 2 \times \frac{3}{5} \times \frac{5}{6} = \frac{2}{3} \times \frac{15}{4} \times \frac{2}{1} \times \frac{1}{2} = \frac{5}{2} = 2\frac{1}{2}$$

Required the product of $5\frac{1}{4}$ and $9\frac{1}{7}$. *Ans.* 51

Required the product of $\frac{1}{2}$, $\frac{2}{3}$, $1\frac{1}{3}$. *Ans.* $\frac{2}{3}$

Required the product of $\frac{1}{2}$, $\frac{4}{9}$, $\frac{1}{3}$. *Ans.* $\frac{2}{27}$

Required the product of $3\frac{1}{2}$, 4 , $\frac{1}{2}$, $\frac{3}{7}$. *Ans.* $2\frac{3}{7}$

DIVISION OF VULGAR FRACTIONS.

REDUCE the fractions as in multiplication; then invert the divisor, and place the product of the numerators over that of the denominators.

Divide $\frac{3}{5}$ by $\frac{4}{7}$. $\frac{3}{5} \div \frac{4}{7} = \frac{3}{5} \times \frac{7}{4} = \frac{21}{20} = 1\frac{1}{20}$.

Divide 4 by $\frac{1}{7}$. $4 \div \frac{1}{7} = \frac{4}{1} \times \frac{7}{1} = 28$.

Divide $2\frac{3}{5}$ by $5\frac{1}{7}$.

$$2\frac{3}{5} \div 5\frac{1}{7} = \frac{12}{5} \div \frac{41}{8} = \frac{12}{5} \times \frac{8}{41} = \frac{96}{205}$$

DECIMAL FRACTIONS.

A DECIMAL fraction is that whose denominator is 1 with as many cyphers annexed to it as there are figures in the numerator.

Decimal fractions are denoted by writing their numerators only, with a point before them. Thus, $\frac{5}{10}$, $\frac{12}{100}$, $\frac{123}{1000}$, &c. are denoted by .5, .12, .123, &c. respectively.

The first, second, third, &c. places of decimals, reckoning from the left hand to the right, are called primes, seconds, thirds, fourths, &c.

Cyphers on the right hand of a decimal do not alter its value. Thus, the decimals .5, .50, .500, &c. have the same value, being each $=\frac{1}{2}$. Cyphers on the left hand of a decimal diminish its value in a decuple proportion. Thus, .5, .05, .005, &c. are $\frac{5}{10}$, $\frac{5}{100}$, $\frac{5}{1000}$, &c. that is, five tenth parts, five hundredth parts, five thousandth parts, &c. respectively.

ADDITION

ADDITION OF DECIMALS.

PLACE the numbers one under another according to the value of their places, or in columns from left to right ; add them together as if they were whole numbers, and point off as many figures on the right hand for decimals as are equal to the greatest number of decimal places in any of the given numbers.

·345

·23

1·023

·021

·045

32

·26

·736

·042

5·36

·626

1·011

38·425

$$3\cdot5 + 47\cdot25 + 927\cdot01 + 2\cdot0073 + 1\cdot5 = 981\cdot2673$$

SUBTRACTION OF DECIMALS.

PLACE the numbers according to their value ; subtract as in whole numbers, and point off the decimals as in addition.

·2345

127·62

2·0345

·0432

13·725

·0037

·1913

113·895

2·0308

MULTIPLICATION OF DECIMALS.

MULTIPLY as in whole numbers, and point off as many figures from the product as there are decimals in both factors. If the product do not contain so many decimals, cyphers must be prefixed to it to supply the defect.

·2304

·0253

2·34

32·15

6912

·00765072

·8190

65·68245

11520

4608

·0582912

DIVISION

DIVISION OF DECIMALS.

DIVIDE as in whole numbers, and from the right hand of the quotient point off as many figures for decimals as the number of decimals in the dividend exceeds the number of decimals in the divisor. If the quotient do not contain so many figures, the defect must be supplied by prefixing cyphers to it. If there be a remainder after all the figures in the dividend are used, cyphers may be annexed to the remainder, and the quotient continued to any degree of exactness. If the number of decimals in the divisor exceed that in the dividend, cyphers must be annexed to the dividend, and the quotient may be continued at pleasure.

$$4 \cdot 2)612 \cdot 318(145 \cdot 79$$

In this example there are three decimal figures in the dividend and one in the divisor ; therefore, according to the rule, I point off two figures in the quotient for decimals ; the rest are whole numbers.

$$36 \cdot 3)155 \cdot 4366(4 \cdot 282$$

$$8 \cdot 45)295 \cdot 75(35$$

$$\cdot 0078) \cdot 4368(56$$

$$\cdot 534) \cdot 30438(\cdot 57$$

$$957)7 \cdot 25406(\cdot 00758$$

$$\cdot 525) \cdot 0007875(\cdot 0015$$

REDUCTION OF DECIMALS.

1. **T**O reduce a vulgar fraction to an equivalent decimal. Divide the numerator by the denominator, as in division of decimals ; the quotient will be the decimal required.

Many fractions cannot be reduced to equivalent decimals ; but they may be reduced to decimals which approximate to the true values.

Reduce $\frac{7}{8}$ to a decimal.

$$8)7 \cdot 000$$

$$\cdot 875$$

$$\frac{1}{4} = \cdot 25, \quad \frac{1}{2} = \cdot 5, \quad \frac{3}{4} = \cdot 75, \quad \frac{1}{3} = \cdot 333 +, \quad \frac{4}{5} = \cdot 8$$

$$\frac{5}{6} = \cdot 833 +,$$

$$\frac{1}{6} = \cdot 375,$$

$$\frac{1}{12} = \cdot 04$$

$$2. \text{ To}$$

2. To reduce numbers of different denominations to equivalent decimals.

Write the given numbers perpendicularly one under another for dividends, proceeding orderly from the least denomination to the greatest. Opposite to each dividend, on the left hand, place such a number, for a divisor, as will reduce it to the next superior denomination. Begin with the highest number, divide each dividend by its proper divisor, and place the quotient, for decimals, on the right hand of the dividend next below it. The last quotient is the decimal required.

Reduce $18s\ 9\frac{1}{2}d$ to the decimal of a pound.

$$\begin{array}{r|l} 4 & 3 \\ -12 & 9.75 \\ 20 & 18.8125 \\ & 0.940625 \end{array}$$

Reduce $3\text{ gr } 21\text{ lb } 14\text{ oz}$ to the decimal of a cwt.

$$\begin{array}{r|l} 16 \left\{ \begin{array}{l} 4 \\ 4 \end{array} \right. & 14 \\ & 3.5 \\ 28 \left\{ \begin{array}{l} 7 \\ 4 \end{array} \right. & 21.875 \\ & 3.125 \\ & 4 & 3.78125 \\ & & 0.9453125 \text{ cwt} \end{array}$$

Reduce $5\text{ dol } 3\frac{1}{4}c$ to the decimal of an eagle.

$$\begin{array}{r|l} 2 & 1 \\ 100 & 3.5 \\ 10 & 5.035 \\ & 0.5035 \text{ E} \end{array}$$

Reduce $2\text{ feet } 7\frac{1}{2}\text{ inches}$ to the decimal of a yard.

$$\begin{array}{r|l} 2 & 1 \\ 12 & 7.5 \\ 3 & 2.625 \\ & 0.875 \text{ yard} \end{array}$$

$$2\text{ dol } 45\frac{1}{4}c = .24525 \text{ E}$$

$$19s\ 5\frac{1}{2}d = .9729167$$

3. To find the value of a decimal in terms of different denominations.

Multiply the given decimal by the number of parts in the next inferior denomination, and point off as many figures on the right hand of the product as there are places in the given decimal. Multiply the figures so pointed off by the next inferior denomination, and point off as before. Proceed thus through all the denominations. The figures on the left hand of the points will be the value required.

Required

ARITHMETIC.

43

Required the value of 940625 l. Required the value of 24525 E.

940625
 20

18812500
 12

9750000
 4

3000000

Ans. $18s 9\frac{1}{2}d$

$875 \text{ l} = 17s 6d$

$5035 \text{ E} = 5 \text{ dol } 3\frac{1}{2}c$

$6725 \text{ cwt} = 2 \text{ qr } 19 \text{ lb } 5 \text{ oz}$

24525
 10

245250
 100

4525000

Ans. $2 \text{ dol } 45\frac{3}{4}c = 2 \text{ dol } 45\frac{3}{4}c$

$42857 \text{ month} = 1 \text{ w } 4d$
 $23b 59' 56''$

THE RULE OF THREE

TEACHES to find a fourth number from three given numbers, which has the same proportion or relation to one of the three given numbers as one of the two remaining numbers has to the other.

RULE. Place the number which is of the same name or quality as that required between the other two numbers; let the number which asks the question stand on the right hand of it, and the other on the left. Consider, from the nature of the question, whether the answer ought to be greater or less than the *mean* or middle term; if greater, multiply the mean by the greater *extreme*, and divide the product by the smaller; if less, multiply the mean by the smaller *extreme*, and divide the product by the greater; the quotient is the answer.

The extremes must be reduced to the same denomination, and the mean to the lowest denomination in it.

The

E

The answer is of the same name as that to which the second term is reduced, and must afterwards be reduced to the highest name possible, or to that name in which accounts are generally kept.

If there be a remainder after the division, reduce it to the next lower denomination, and divide by the same divisor. Proceed thus till the remainder be reduced to the least name possible.

Note. When it can be done, multiply and divide as in compound multiplication and division.

If the first term, and either the second or third can be divided by any number without a remainder, let them be so divided, and the quotients used instead of them.

1. If 6 cost 1 dol 50 cents, what cost 36?

$$6 : 150 :: 36$$

It is plain that 36 of any thing will cost more than 6, consequently the answer will be greater than the second term; therefore multiply the mean 150 by the greater extreme 36, and divide the product by the less extreme 6.

150

36

900

450

6)5400

900 = 9 dol, the ans.

$$\text{Or, } \frac{150 \times 36}{6} = 150 \times 6 = 900 \text{ cents}$$

2. If 35 cost 17 dol 50 cents, what cost 5?

$$35 : 1750 :: 5$$

It is evident that 5 will cost less than 35; therefore multiply the mean by the less extreme, and divide the product by the greater.

$$\frac{1750 \times 5}{35} = \frac{1750}{7} = 250 = 2 \text{ dol } 50 \text{ c}$$

3. If

3. If 3 yards of linen cost 9 s, what will 6 yards cost?

Ans. 18 s

4. If 2 yards of linen cost 4 s, what will 8 yards cost?

Ans. 16 s

5. If 6 lb of sugar cost 9 s, what will 30 lb cost?

Ans. 45 s = 2 l 5 s

6. If 3 yards of silk cost 17 s, what will 24 yards cost?

Ans. 6 l 16 s

7. If 45 s buy 30 lb of sugar, how much will 9 s buy?

$$\begin{array}{ccccccc} s & & lb & & s & & \\ 45 & : & 30 & :: & 9 & : & \frac{30 \times 9}{45} = \frac{30}{5} = 6 lb \end{array}$$

8. If 8 men can do a piece of work in 12 days, in how many days can 16 men do it?

$$\begin{array}{ccccccc} m & & days & & m & & \\ 8 & : & 12 & :: & 16 & : & \frac{12 \times 8}{16} = \frac{12}{2} = 6 days \end{array}$$

It is evident that the answer must be less than the second term, for 16 men will do the work in fewer days than 8 men; therefore multiply the mean by the less extreme, and divide the product by the greater.

9. If 16 men do a piece of work in 6 days, how many men will do it in 12 days?

$$\begin{array}{ccccccc} days & & m & & days & & \\ 6 & : & 16 & :: & 12 & : & \frac{16 \times 6}{12} = \frac{16}{2} = 8 men \end{array}$$

10. If 5 yards of cloth cost 1 l 10 s, what will 20 yards cost?

$$\begin{array}{ccccccc} yds & & l & & s & & yds \\ 5 & : & 1 & 10 & = & 30 & :: & 20 & : & \frac{30 \times 20}{5} = \\ 30 \times 4 = 120 s = 6 l \end{array}$$

11. If 3 lb of butter cost 3 s 6 d, what will 27 lb cost?

$$\begin{array}{ccccccc} lb & & s & & d & & lb \\ 3 & : & 3 & 6 & :: & 27 & : & \frac{(3 s 6 d) \times 27}{3} = (3 s 6 d) \\ \times 9 = 1 l 11 s 6 d. \end{array}$$

12. Required

12. Required the price of 50 gallons of wine at 30 cents a quart.

$$\begin{array}{rcl}
 \text{qt} & & \text{gal} \\
 1 & : & 30 \\
 50 & : & 50 \\
 \hline
 & & 4 \\
 & & 200 \\
 & & 30 \\
 \hline
 & & 6000 = 60 \text{ dol}
 \end{array}$$

13. If 50 gallons of wine cost 60 dol, what will a quart cost?

$$\begin{array}{rcl}
 \text{gal} & & \text{dol} & & \text{qt} \\
 50 & : & 60 & : & 1 \\
 4 & & 100 & & \\
 \hline
 200 & & 6000 & & \\
 \hline
 & & 30 \text{ cents} & &
 \end{array}$$

14. Required the price of 15 gallons of brandy at 25 cents a pint. Ans. 30 dol

15. If 15 gallons of brandy cost 30 dol, what is that a quart? Ans. 50 c

16. If 1 cwt of tobacco cost 5 l 10 s, what will 8 cwt cost?

$$\begin{array}{rcl}
 \text{cwt} & & \text{l} & & \text{s} & & \text{cwt} \\
 1 & : & 5 & : & 10 & : & 8 \\
 & & & & 8 & & \\
 \hline
 & & 44 & & 0 & &
 \end{array}$$

In this example the middle term need not be reduced to the lowest denomination in it, because the first term is 1, and therefore the answer may be found by compound multiplication, as above.

17. If 1 cost 2 s 3 d, what will 127 cost?

Ans. 14 l 5 s 9 d

18. If

18. If 36 bushels of wheat cost 11 l 14 s, what will 1 bushel cost?

$$\begin{array}{r} \text{bus} \quad \text{l} \quad \text{s} \quad \text{bus} \\ 36 : 11 \quad 14 :: 1 \end{array}$$

$$\begin{array}{r} 36)234(6 \\ 216 \\ \hline \end{array}$$

$$\text{Or, } 6)11 \quad 14$$

$$\begin{array}{r} 18 \\ 12 \\ \hline \end{array}$$

$$6)1 \quad 19$$

$$\begin{array}{r} 6 \quad 6 \\ \hline \end{array}$$

$$\begin{array}{r} 36)216(6 \\ 216 \\ \hline \end{array}$$

Ans. 6 s 6 d

19. If 7 yards of cloth cost 17 s 6 d, what will 22 yards cost?

$$\begin{array}{r} \text{yds} \quad \text{s} \quad \text{d} \quad \text{yds} \\ 7 : 17 \quad 6 :: 22 \end{array}$$

$$\begin{array}{r} 12 \\ \hline \end{array}$$

$$\begin{array}{r} 210 \\ \hline \end{array}$$

$$\begin{array}{r} 22 \\ \hline \end{array}$$

$$\begin{array}{r} 420 \\ \hline \end{array}$$

$$\begin{array}{r} 420 \\ \hline \end{array}$$

$$7)4620$$

$$12)660$$

$$20)515$$

$$\begin{array}{r} 2 \quad 15 \\ \hline \end{array}$$

$$\begin{array}{l} \text{Or, } \frac{210 \times 22}{7} = 30 \times 22 \\ = 660 \text{ d} = 55 \text{ s} = 2 \text{ l } 15 \text{ s} \end{array}$$

$$\begin{array}{l} \text{Or, } \frac{\text{six-pences} \times 22}{7} = 5 \times 22 = 110 \text{ pence} \\ = 5 \text{ l } 10 \text{ s} = 2 \text{ l } 10 \text{ s} \end{array}$$

$$5 \times 11 = 55 \text{ s} = 2 \text{ l } 15 \text{ s}$$

20. If 9 yards of cambric cost 5 l 12 s, what will 72 yards cost?

$$\begin{array}{r} \text{yds} \quad \text{l} \quad \text{s} \quad \text{yds} \\ 9 : 5 \quad 12 :: 72 \end{array}$$

$$\frac{(5/12)}{9} \times 72 = (5/12) \times 8 = 40 \text{ s} = 4 \text{ l } 8 \text{ s}$$

$$\times 8 = 44 \text{ l } 16 \text{ s}$$

$$21 \text{ l } 16 \text{ s}$$

21. If 72 yards of cambrick cost $44/16s$, what will 9 cost?

$$\begin{array}{rcll} yds & l & s & yds \\ 72 & : & 44 & 16 :: 9 : \frac{(44/16s) \times 9}{72} = \\ \frac{44/16s}{8} & = & 5/12s & \end{array}$$

22. If $7\frac{1}{4}$ cwt of sugar cost $26/10s 4d$, what will $43\frac{1}{2}$ cwt cost?

$$\begin{array}{rcll} cwt & l & s & d \\ 7\frac{1}{4} & : & 26 & 10 & 4 :: 43\frac{1}{2} \\ 4 & & 20 & & 4 \\ \hline 29 & & 530 & & 174 \\ & & 12 & & \end{array}$$

$$\frac{6364 \times 174}{29} = 6364 \times 6 = 38184d = 3182s = 159/2s$$

23. If 1 lb of sugar cost 9d, what will $4\frac{1}{2}$ cwt 14 lb cost?
Ans: 18/7s 6d

24. If 1 pint of wine cost 10 pence, what will 6 bbd cost?
Ans: 126/

25. A draper bought 400 yards of cloth for 920 dollars, and lost 60 dollars by the bargain. How did he sell it a yard?

$$\begin{array}{rcll} yds & dol & yd & \\ 400 & : & 920 - 60 = 860 & :: 1 : \frac{86}{40} = \frac{43}{20} = \\ 2 dol 15c & & & \end{array}$$

26. A ship of war having 250 men exclusive of officers, took a prize worth 30750 dollars, and the shares of the officers amounted to half the value of the prize. Required the share of each man.
Ans: 61 dol 50c

27. How many gallons of brandy may be bought for 18/18s at 6s a gallon?

$$\begin{array}{rcll} gal & l & s & gal \\ 6 & : & 18 & 18 :: 63 \end{array}$$

ARITHMETIC

28. How many gallons of wine may be bought for 33 l at 7 l 6 d a gallon? *Ans.* 88 gal

29. Required the price of 20 tons 17 cwt 2 qr of cheese at 16 l 16 s per ton.

$$\begin{array}{r}
 \begin{array}{rcl}
 \text{l} & \text{s} & \text{d} \\
 1 & : & 16 \quad 16 \quad :: \quad 20 \quad 17 \quad 2 \\
 20 & & 20 \quad \quad \quad 20 \\
 \hline
 20 & 336 & 417 \\
 4 & & 4 \\
 \hline
 80 & & 1670 \times 336 \\
 & & \hline
 & & 80
 \end{array}
 \end{array}
 = 167 \times 42 =$$

$$7014 s = 350 l 14 s$$

30. If 1 lb of silk cost 1 l 9 s 6 d, what will 25 lb 8 oz cost?

$$\begin{array}{r}
 \begin{array}{rcl}
 \text{lb} & \text{l} & \text{s} & \text{d} \\
 1 & : & 1 \quad 9 \quad 6 \quad :: & 25 \quad 8 \\
 16 & & 20 & 16 \\
 \hline
 16 & 29 & 158 \\
 12 & & 125 \\
 \hline
 354 & & 408 \times 354 \\
 & & \hline
 & & 16
 \end{array}
 \end{array}
 = 58 \times 177 =$$

$$6027 d = 37 l 12 s 3 d$$

31. If 26 bags of hops cost 68 l 18 s, what will 8 bags cost?

$$\begin{array}{r}
 \begin{array}{rcl}
 \text{l} & \text{s} & \text{d} \\
 26 & : & 68 \quad 18 \quad :: & 8 \\
 13 & & 20 & 4 \\
 \hline
 1378 & & 1378 \times 4 \\
 13 & & \hline
 106 & & 106 \times 4 = 424 s = 21 l 4 s
 \end{array}
 \end{array}$$

A TREATISE OF

32. A person owes 1230 *l*, and his effects are only 522 *l*.
 15. What will he pay in the pound?

$$\begin{array}{r} 1230 : 522 \quad 15 : 1 \\ \hline \end{array}$$

$$\begin{array}{r} 1230 \overline{) 10455 (6} \\ \underline{9840} \end{array}$$

$$\begin{array}{r} 615 \\ 12 \end{array}$$

Ans. 8 *s* 6 *d*

$$\begin{array}{r} 1230 \overline{) 7380 (6} \\ \underline{7380} \end{array}$$

33. A person owes 1000 *l*, and pays 12 *s* 6 *d* in the pound. Required his effects.

$$1 : 12 \quad 6 : 1000 : 625$$

34. A person failing has 10000 dollars; and pays 75 *c* per dollar. Required his debt.

$$\begin{array}{r} \text{c} \quad \text{dol} \quad \text{dol} \quad \text{dol} \quad \text{c} \\ 75 : 1 : 10000 : 13333 \quad 33\frac{1}{3} \end{array}$$

35. If 415 *lb* of tea cost 166 *l*, what is the price of 1 *lb*? *Ans.* 8 *s*

36. If 320 yards of flannel cost 20 *l*, what is the price of 1 yard? *Ans.* 1 *s* 3 *d*

37. Bought a quantity of silver for 10 *l* 12 *s* at 5 *s* 4 *d* per oz. Required the weight.

$$5 \quad 4 : 1 : 10 \quad 12 : \frac{2544}{64} = \frac{159}{4} = 39 \text{ oz } 15 \text{ dwt}$$

38. What is the value of a piece of silver weighing 3 *lb* 3 oz 15 dwt at 5 *s* 4 *d* per oz?

$$\begin{array}{r} \text{oz} \quad \text{d} \quad \text{lb oz dwt} \\ 1 : 5 \quad 4 : 3 \quad 3 \quad 15 : \frac{795 \times 64}{20} \text{ d} = 159 \end{array}$$

$$\times 16 = 10 \text{ l } 12 \text{ s}$$

39. If

39. If $5\frac{1}{2}$ yards of velvet cost $4\frac{1}{2}$ $\text{\$}$, what will $84\frac{1}{2}$ yards cost?

$$\begin{array}{r} \text{yds} \quad \text{\$} \quad \text{yds} \\ 5\frac{1}{2} : 4\frac{1}{2} :: 84\frac{1}{2} : x \\ \hline 4\frac{1}{2} \times 20 = 90 \\ 84\frac{1}{2} \times 2 = 169 \\ \hline 90 - 169 = -79 \end{array}$$

40. Required the price of $15\frac{1}{2}$ chords of wood at $5\frac{1}{2}$ dollars a chord. *Ans.* $85\frac{1}{2}$ $\text{\$}$

41. Bought 36 pipes of wine for 4536 dollars; how must I sell it a pipe to save one for my own use, and sell the rest for what the whole cost?

$$\begin{array}{r} \text{\$} \quad \text{dol} \quad \text{\$} \quad \text{dol} \\ 35 : 4536 :: 1 : x \\ \hline 4536 \times 1 = 4536 \\ 35 \times 129 = 4515 \\ \hline 4536 - 4515 = 21 \end{array}$$

42. Bought a cask of brandy, containing 26 gallons, for $1\frac{1}{2}$ dollar a gallon, and 2 gallons leaked out. How must the rest be sold a gallon that no loss may be sustained?

$$24 \times 1.5 = 36 \text{ dollars} \quad \text{Ans. } 1 \text{ dol } 62\frac{1}{2} \text{ c}$$

43. A vessel containing 100 gallons receives 5 gallons and discharges 3 in 20'. In what time will it be full?

$$\begin{array}{r} \text{gal} \quad \text{gal} \\ 100 : 20 :: 105 : x \\ \hline 100 \times 2 = 200 \\ 105 \times 1.9 = 199.5 \\ \hline 200 - 199.5 = 0.5 \end{array}$$

44. A set out on monday morning, and travelled 30 miles a day; B set out on wednesday morning and travelled 42 miles a day. In what time will B overtake A?

A had travelled 60 miles when B set out, and B gained 12 miles a day.

$$\begin{array}{r} \text{m} \quad \text{day} \\ 60 : 12 :: 5 : x \\ \hline 60 \times 1 = 60 \\ 12 \times 5 = 60 \end{array}$$

45. If a person lend me 450 dollars for 10 weeks, how long ought I to lend him 300 dollars to requite his kindness?

$$\begin{array}{r} \text{dol} \quad \text{w} \quad \text{dol} \\ 450 : 10 :: 300 : x \\ \hline 450 \times 10 = 4500 \\ 300 \times 15 = 4500 \end{array}$$

46. If I lend a friend 200 $\text{\$}$ for 5 months, how long may I keep 500 $\text{\$}$ of his money to indemnify myself?

$$200 \times 5 = 1000 \quad \text{Ans. } 2 \text{ months}$$

47. How

47. How much printed paper $\frac{1}{4}$ of a yard wide will line a room 70 yards in circumference and 6 yards high?

yds broad yds long yd broad
 $6 \times 70 \times \frac{1}{4} = \frac{6 \times 70 \times 4}{4} = 560 \text{ yards}$

48. How many yards of carpeting $3\frac{1}{2}$ feet wide will cover a floor 20 feet long and $15\frac{1}{2}$ feet broad?

15 6 : 20 11 3 6
 12 12
 186 30

49. If 24 lb of raisins cost 1 dol 75 c, what will 18 fraile cost, each frail weighing 3 q 18 lb?

$$\frac{175 \times 18 \times 102}{175 \times 3 \times 51} = 18 \times 102 = 1836 \text{ dol } 87\frac{1}{2}c$$

50. In 90 pence N. England money how many cents?

$$\frac{100 \times 10}{8} = 1250$$

51. In 500 cents how many pence N. E. money ?

$$100 : 72 :: 500 : \frac{72 \times 500}{100} = 360d = 30s$$

52. In 30 / how many dollars at 6 s each ?

$$6 : \overset{\text{dol}}{r} :: 30 = 600 : 100$$

53. In 24/10s 6d how many dollars at 6s each?

$$\frac{d}{72} : 1 :: \frac{1}{24} : \frac{d}{10} = 5886 : \frac{5886}{72} = \frac{654}{8}$$

ARITHMETIC.

54. In 40*l* how many dollars at 8*s* each?

$$\begin{array}{ccccccc} & s & & dol & & l & & s & & dol \\ 8 & : & 1 & :: & 40 & = & 800 & : & 100 \end{array}$$

55. In 37*l* 10*s* how many dollars at 7*s* 6*d* each?

$$\begin{array}{ccccccc} & s & & d & & dol & & l & & s & & d & & dol \\ 7 & 6 & = & 90 & : & 1 & :: & 37 & 10 & = & 900 & : & 100 \end{array}$$

56. In 101 dollars at 6*s* each how many pounds?

$$\begin{array}{ccccccc} & dol & & s & & dol & & l \\ 1 & : & 6 & :: & 101 & : & 606 & = & 30 & 6 \end{array}$$

57. In 199*l* dollars at 7*s* 6*d* how many pounds?

$$\begin{array}{ccccccc} & dol & & s & & d & & dol \\ 1 & : & 7 & 6 & = & 90 & :: & 199 \frac{1}{2} \end{array}$$

$$\begin{array}{r} 3 \\ -3 \\ \hline 598 \end{array}$$

$$\frac{598 \times 90}{3} = 17940 d = 74 \frac{1}{2} 15s$$

$$\begin{array}{ccccccc} & dol & & s & & d & & dol \\ Or, & 1 & : & 7 & 6 & = & \frac{15}{2} & :: & 199 \frac{1}{2} & = & \frac{598}{3} & : & \frac{598}{3} \times \frac{15}{2} \end{array}$$

$$= 299 \times 5 = 1495s = 74 \frac{1}{2} 15s$$

58. In 123450 cents how many pounds at 8*s* to a dollar?

$$\begin{array}{ccccccc} & c & & s & & c & & s \\ 100 & : & 8 & :: & 123450 & : & 9876 & = & 493 & 16 \end{array}$$

59. A farmer hired a man for 6 months at 12 dollars a month, on condition that he should forfeit half a dollar for every day he was absent. Now he was absent 30 days, and received 8/8*l*. What remains due, supposing a dollar equal to 6*s*?

Ans. 34*l*

60. If bread be 6 cents per *lb* when wheat is 1 dollar a bushel, what will it be per *lb* when wheat is 1 $\frac{1}{2}$ dollar a bushel?

$$1 : 6 :: 1 \frac{1}{2} = \frac{3}{2} : \frac{6 \times 3}{2} = 9$$

61. If a loaf of bread, the price of which is 12 cchts, weigh 1 lb when wheat is 9 dollars a bushel, what will it weigh when wheat is 12 dollars a bushel?

$$\begin{array}{ccccccc} & \text{dol} & \text{lb} & & \text{dol} & \text{lb} & \\ 9 & : & 1 & :: & 12 & : & \frac{9}{12} = \frac{3}{4} = 12 \text{ cts} \end{array}$$

62. If a certain quantity of pasture will last 1926 sheep 7 weeks, how many must be turned out that it may last the remainder 9 weeks?

$$\begin{array}{ccccccc} w & & s & & w & & \\ 7 & : & 1926 & :: & 9 & : & \frac{1926 \times 7}{9} = 214 \times 7 = 1498 \end{array}$$

Then $1926 - 1498 = 428$ Ans.

63. If a person have 456 l 15 s per annum, and spend 4 l 13 s 4 d per week, how much does he save per annum?

$$\begin{array}{ccccccc} w & & l & & s & & d \\ 1 & : & 4 & 13 & 4 & :: & 52 : 242 \ 13 \ 4 \text{ what he spends (a year.)} \\ & & & & & & \begin{array}{r} 456 \ 15 \\ 242 \ 13 \ 4 \\ \hline 214 \ 1 \ 8 \text{ Ans.} \end{array} \end{array}$$

64. A person has 251 l 12 s 6 d a year, and saves 60 l a year, how much does he spend a day?

$$\begin{array}{ccccccc} & & l & & s & & d \\ & & 251 & & 12 & & 6 \\ & & 60 & & & & \\ \hline & & 191 & & 12 & & 6 \end{array}$$

days $\frac{191 \ 12 \ 6}{365} :: 1 : 10 \ 6$

65. A person spends 1 dol 30 c a day, and saves 300 dol a year. Required his income. Ans. 774 dol 50 c

66. What is the interest of 575 l for 1 year at 5 l per cent?

$$\begin{array}{ccccccc} l & & & & l & & \\ 100 & : & 5 & :: & 575 & : & \frac{5 \times 575}{100} = \frac{115}{4} = 28 \ 15 \ s \end{array}$$

67. Required

67. Required the interest of $123\frac{1}{10}s$ for 1 year, at $4\frac{1}{2}$ per cent.

$$\begin{array}{r} l \quad l \quad l \quad s \\ 100 : 4\frac{1}{2} :: 123 \quad 10 \end{array} \quad \text{Otherwise. } 4\frac{1}{2}l = 4\cdot5l, \quad 123\frac{1}{10}s = 123\cdot5l$$

$$\begin{array}{r} 4\frac{1}{2} \\ \hline 494 \quad 0 \\ 61 \quad 15 \\ \hline \end{array}$$

$$\begin{array}{r} l \quad l \quad s \\ 100 : 4\cdot5 :: 123\cdot5 \\ \hline 4\cdot5 \end{array}$$

$$1|00)5|55 \quad 15$$

$$20$$

$$1|00)11|15$$

$$12$$

$$1|00)1|80$$

$$4$$

$$1|00)3|20$$

Ans. $5\frac{1}{10}s \quad 1\frac{1}{4}d$

$$6175$$

$$4940$$

$$100)555\cdot75$$

$$5\cdot5575$$

$$= 5\frac{1}{10}s \quad 1\frac{1}{4}d$$

68. Required the interest of 550 dollars for 1 year at 6 per cent. Ans. 33 dol

69. Required the interest of 250 dollars 50 cents for 1 year at 5 per cent. Ans. 12 dol 52½ c

70. Required the interest of 2345 dollars for 1 year at 5½ per cent. Ans. 152 dol 42½ c

71. Required the interest of 650 dollars for 4 months at 7 per cent, per annum.

$$\begin{array}{r} mo \quad dol \quad mo \quad dol \\ 12 : 7 :: 4 : \frac{7}{3} = 3\frac{1}{3} \end{array}$$

12 : 7 :: 4 : $\frac{7}{3}$ = $3\frac{1}{3}$ dol the interest of 100 dol in 4 months.

$$\begin{array}{r} dol \quad dol \\ 100 : \frac{7}{3} :: 650 : \frac{65 \times 7}{10 \times 3} = 15\frac{1}{3} \end{array}$$

72. Required the interest of 962 dollars for 20 weeks at 5½ per cent.

$$\begin{array}{r} dol \quad c \\ 100 : 550 :: 962 : \frac{55 \times 962}{10} = 11 \times 481 \end{array}$$

= 5291 c the interest of 962 dol in a year.

$$\begin{array}{r} w \quad c \\ 52 : 5291 :: 20 : \frac{5291 \times 20}{26} = 20 \text{ dol } 35 \text{ c} \end{array}$$

F

73. Required

73. Required the interest of 120 *l* for 8 months at 5 *l* per cent. *Ans.* 4 *l*

74. Required the interest of 1500 dollars 50 cents for 6 months at six per cent. *Ans.* 45 *dol* 1 $\frac{1}{2}$ *c*

75. Required the interest of 860 dollars for 60 days at 7 per cent.

$\frac{\text{dol}}{100} : \frac{\text{dol}}{7} :: \frac{\text{dol}}{860} : \frac{6020}{100} = 60 \text{ dol } 20 \text{ c}$ the interest of 860 *dol* in a year.

$\frac{\text{days}}{365} : \frac{\text{c}}{6020} :: \frac{\text{days}}{60} : \frac{6020 \times 12}{73} \text{ c} = 9 \text{ dol } 89 \frac{47}{100} \text{ c}$

76. What is the tax of an estate of 200 *l* 10 *s* per ann, at 2 *s* 6 *d* in the pound?

$\begin{matrix} \text{s} & \text{s} & \text{d} & \text{d} & \text{l} & \text{s} & \text{s} \\ 20 & : & 2 & 6 = 30 & :: & 200 & 10 = 4010 : \frac{30 \times 4010}{20} \\ & & & & & & = 3 \times 2005 = 6015 \text{ d} = 25 \text{ l } 1 \text{ s } 3 \text{ d} \end{matrix}$

77. What is the insurance of property to the amount of 10000 dollars at 4 per cent? *Ans.* 400 *dol*

78. Required the insurance of 900 *l* at 10 $\frac{1}{2}$ *l* per cent. *Ans.* 96 *l* 15 *s*

79. Required the insurance of 712 *l* 6 *s* for 8 months at 7 $\frac{1}{2}$ *l* per cent per ann.

$\frac{\text{mo}}{12} : \frac{\text{l}}{7\frac{1}{2}} = \frac{15}{2} :: \frac{\text{mo}}{8} : \frac{15 \times 8}{2 \times 12} = 5 \text{ l}$ the insurance of 100 *l* for 8 months.

$\frac{\text{l}}{100} : \frac{\text{l}}{5} :: \frac{\text{l}}{712} : \frac{\text{s}}{35} \quad \frac{\text{l}}{35} : \frac{\text{s}}{12} : \frac{\text{d}}{3\frac{3}{4}}$

80. If an estate be worth 384 *l* 16 *s* a year, and the taxes be 2 *s* 9 *d* in the pound, what is the net annual value?

Ans. The taxes are 52 *l* 18 *s* 2 $\frac{3}{4}$ *d*, and the net value is 331 *l* 17 *s* 9 $\frac{3}{4}$ *d*

81. Bought 10 pipes of wine at 1 $\frac{1}{4}$ dollar a gallon, and sold it at 8 *s* 6 *d* a gallon. Required the gain.

1 $\frac{1}{4}$ *dol* = 7 *s* 6 *d*, \therefore the gain per gallon is 1 *s*, \therefore the whole gain is 63 *l* = 210 *dol*.

82. Bought

82. Bought 300 bushels of wheat at 1 dollar a bushel, and sold it at $1\frac{1}{4}$ dollar a bushel. Required the whole gain.

The gain is 25 c per bushel ; therefore

$$\begin{array}{cccc} \text{bus} & c & \text{bus} & \text{dol} \\ 1 & : 25 & :: 300 & : 75 \end{array}$$

83. Bought 150 barrels of flour for 1500 dollars, and sold it for $10\frac{1}{2}$ dollars a barrel. Required the gain.

Ans. 75 dol

84. Bought $5\frac{1}{2}$ cwt of cheese at 10 dollars per cwt, and sold it at 10 cents per lb. Required the gain or loss.

$$\begin{array}{cccccc} \text{lb} & c & \text{lb} & \text{dol} & c & \\ 1 & : 10 & :: 112 & : 11 & 20 & \end{array} \text{ Therefore the gain}$$

per cwt is 120 cents.

$$\begin{array}{cccccc} \text{cwt} & c & \text{cwt} & \text{dol} & c & \\ \text{Hence } 1 & : 120 & :: 5\frac{1}{2} & : 6 & 60 \end{array}$$

85. A grocer bought $5\frac{1}{2}$ cwt 14 lb of tobacco at 25 c per lb, and sold the whole for 164 dollars. How much did he gain or lose by the bargain ?

Ans. He lost 50 c

86. A person gave 8 guineas for 2 bags of hops, each bag weighing $1\frac{1}{2}$ cwt 10 lb ; and sold them by retail at 13 c per lb. What did he gain or lose by the bargain ?

$$(1\frac{1}{2} \text{ cwt } 10 \text{ lb}) \times 2 = 3 \text{ cwt } 20 \text{ lb} = 356 \text{ lb}$$

$$8 \text{ gu} = 8 \times 28 = 224 \text{ s} = 37\frac{1}{2} \text{ dol}$$

$$\begin{array}{cccc} \text{lb} & c & \text{lb} & c \\ 1 & : 18 & :: 356 & : 6408 \end{array}$$

$$6408 - 3733\frac{1}{2} = 2674\frac{1}{2} = 26 \text{ dol } 74\frac{1}{2} c$$

87. A cheesemonger bought 650 cheeses, weighing one with another 15 lb, for 145 l, and sold them at $12\frac{1}{2}$ c per lb. What did he gain or lose ?

Prime cost 483 dol $33\frac{1}{2}$ c, sold for 468 dol 75 c ; therefore he lost 14 dol $58\frac{1}{2}$ c

88. A merchant bought 4 chests of cambric for 980 l ; each chest contained 3 parcels, each parcel 7 pieces, and each piece $17\frac{1}{2}$ yards. What did it cost a yard ?

$$4 \times 3 \times 7 \times 17\frac{1}{2} \text{ yds} : 980 \text{ l} :: 1 \text{ yd} : 13 \text{ s } 4 \text{ d} = 2 \text{ dol } 22\frac{2}{3} c$$

89. A

89. A woollen draper bought 4 packs of cloth at 13s 6d a yard; each pack contained 3 parcels, each parcel 7 pieces, and each piece 24 yards. Required the price of the whole.

$$\begin{array}{rcll} \text{yd} & \text{s} & \text{d} & \\ 1 & : & 13 \ 6 & :: 4 \times 3 \times 7 \times 24 : 1360 \ 16 = \\ 4536 \text{ dol} & & & \end{array}$$

90. A draper bought 4 bales of cloth, each bail contained 7 pieces, and each piece 24 yards; also the price of one piece was 9l 18s. Required the price of the whole, and the price per yard.

$$\begin{array}{rcll} \text{l} & \text{s} & & \\ 1 & : & 9 \ 18 & :: 28 : 277 \ 4 = 624 \end{array}$$

$$\begin{array}{rcll} \text{yds} & \text{l} & \text{s} & \\ 24 & : & 9 \ 18 & :: 1 : 8 \ 3 = 1 \ 37\frac{1}{2} \end{array}$$

91. A merchant imported 18 pipes of wine; the prime cost was 549l 10s 6d, the freight 33l 12s, customs 61l 1s, and other expenses 17l 6s 6d. What did the wine cost per gallon?

$$\begin{array}{r} \text{l} \quad \text{s} \quad \text{d} \\ 549 \quad 10 \quad 6 \\ 33 \quad 12 \\ 61 \quad 1 \\ 17 \quad 6 \quad 6 \\ \hline 661 \quad 10 \end{array}$$

$$18 \times \begin{array}{r} \text{gal} \\ 126 \end{array} : 661 \ 10 :: 1 : 5 \ 10 = 97\frac{1}{2}$$

92. A grocer bought an equal quantity of sugar, tea, and tobacco for 704l 3s 4d; he gave 10½ per lb for the sugar, 5s 9d per lb for the tea, and 1s 8½d per lb for the tobacco. Required the quantity of each.

$$\begin{array}{rcll} 10\frac{1}{2} & & & \\ 5 \ 9 & \text{s} \ \text{d} \ \text{lb} & & \text{l} \ \text{s} \ \text{d} \ \text{lb} \\ 1 \ 8\frac{1}{2} & 8 \ 4 : 3 :: 704 \ 3 \ 4 : 5070, \text{ a} \\ \hline 8 \ 4 & \text{third of which is } 1690 \text{ lb the ans.} & & \end{array}$$

93. If

93. If 100 dollars in 12 months gain 5 dollars interest, what principal will gain the same interest in 8 months?

$$\begin{array}{ccccccc} \text{mo} & & \text{dol} & & \text{mo} & & \\ 12 & : & 100 & :: & 8 & : & \frac{100 \times 5}{2} = 150 \text{ dol} \end{array}$$

94. If 100 dollars in 12 months gain 5 dollars interest, in what time will 150 dollars gain the same interest?

$$\begin{array}{ccccccc} \text{dol} & & \text{mo} & & \text{dol} & & \\ 100 & : & 12 & :: & 150 & : & \frac{12 \times 100}{150} = 8 \text{ mo} \end{array}$$

95. What sum of money will amount to 1500 dollars in 15 months at 7 per cent, simple interest?

$$\begin{array}{ccccccc} \text{mo} & & \text{dol} & & \text{mo} & & \\ 12 & : & 7 & :: & 15 & : & \frac{7 \times 5}{4} \text{ dol, the interest of 100} \\ \text{dol in 15 mo.} & \therefore & 100\frac{1}{2} \text{ dol the amount of 100 dol in 15 mo.} & & & & \\ \text{dol} & & \text{dol} & & \text{dol} & & \\ 100\frac{1}{2} & : & 100 & :: & 1500 & : & \frac{150000 \times 4}{435} = 1379\frac{2}{3} \text{ dol} \end{array}$$

96. A sold 150 pine apples at $33\frac{1}{3}c$ a piece, and received as much money as B received for a certain number of water melons, which he sold at $25c$ a piece. How much money did each receive, and how many melons had B?

$$33\frac{1}{3} \times 150 = 5000c = 50 \text{ dol, what each received.}$$

$$\begin{array}{ccccccc} c & & \text{mel} & & c & & \text{mel} \\ 25 & : & 1 & :: & 5000 & : & 200 \end{array}$$

97. Sold goods at the rate of $1s 9d$ in the pound profit; what is the gain per cent?

$$\begin{array}{ccccccc} l & & s & & d & & l & & l & & s \\ 1 & : & 1 & 9 & :: & 100 & : & 8 & 15 \end{array}$$

98. If tea cost 1 dol 25 c per lb, how must it be sold per lb to gain 25 per cent?

$$\begin{array}{ccccccc} \text{dol} & & c & & \text{dol} & & \\ 100 & : & 125 & :: & 125 \text{ or, } 4 & : & 5 :: 125 : \frac{125 \times 5}{4} c \\ & & & & & & \\ & & & & & & = 1 \text{ dol } 56\frac{1}{4}c \end{array}$$

99. Bought at 6 c per lb, and sold at 8 dol 50 c per cwt. Required the gain per cent.

The gain per cwt is 178 c; $\therefore 850 c : 178 c :: 100 \times 100 c : \frac{178 \times 100 \times 10}{85} c = \frac{178 \times 200}{17} = 20 \text{ dol } 94\frac{2}{3} c$

100. Bought cloth at $1\frac{1}{4}$ dol a yard, and lost 10 per cent. How was it sold a yard?

$\frac{\text{dol}}{100} : \frac{c}{125} :: \frac{\text{dol}}{90} ; \frac{125 \times 9}{10} c = 1 \text{ dol } 12\frac{1}{2} c$

101. Bought tobacco at 2 s 1 d per lb, and sold it at 2 s 4 d per lb. Required the gain.

$\frac{d}{25} : \frac{d}{3} :: \frac{l}{100} : \frac{l}{12}$

102. If 1 cwt of tea cost 40 l 8 s, how must it be sold per lb to gain 10 l by the whole?

$\frac{lb}{112} : \frac{l}{50} \text{ } 8 = \frac{1008}{1} :: \frac{l}{1} : \frac{s}{9}$

103. If I buy $4\frac{3}{4}$ cwt 7 lb of coffee for 137 l 1 s 4 d, how must I sell it per lb to gain 42 l 12 s? *Ans.* 6 s 8 d

104. Sold cloth at 2 dol 50 c per yard, and gained 10 per cent; what will be the gain per cent when it is sold at 2 dol 75 c per yard?

$\frac{c}{250} : \frac{\text{dol}}{110} :: \frac{c}{275} : \frac{275 \times 11}{25} = 11 \times 11 = 121 \text{ dol}; \therefore \text{the gain per cent is } 21 \text{ dol}$

105. Sold sugar at 16 c per lb, and gained 10 per cent; what will be the gain or loss per cent, when it is sold at 12 c per lb? *Ans.* 17 dol 50 c loss

106. Sold 60 yards of cloth for 17 l 1 s, and gained 10 per cent; what did the cloth cost per yard?

$\frac{l}{110} : \frac{l}{17} \text{ } 1 = \frac{341}{1} :: \frac{100}{1} : \frac{341 \times 10}{11}, = \text{prime cost}$

$60 \text{ yds} : \frac{341 \times 10}{11} s :: 1 \text{ yd} : \frac{341}{6 \times 11} = 5 s 2 d$

107. A

107. A merchant bought 10 tuns of wine for 669 *l* 7 *s* 6 *d*, and lost 20 per cent by the bargain. How was it sold a gallon?

$$\begin{array}{r} \text{1} \quad \text{1} \quad \text{1} \quad \text{s} \quad \text{d} \quad \text{1} \quad \text{s} \quad \text{d} \\ 100 : 80 :: 669 \quad 7 \quad 6 : \frac{4}{5} \times (669 \quad 7 \quad 6) \\ = 535 \quad 10 \quad \text{s} \\ \text{s} \quad \text{1} \quad \text{s} \quad \text{gal} \\ 10 : 535 \quad 10 :: 1 : \frac{10710}{10 \times 252} \text{s} = \frac{119}{28} = \frac{17}{4} \\ = 4 \text{s} \quad 3 \text{d} \end{array}$$

108. Bought 300 gallons of rum at $1\frac{1}{4}$ dollar a gallon, and lost 10 gallons by accident; how must I sell the rest a gallon to gain upon the whole prime cost at the rate of 10 per cent?

The prime cost is 375 dollars, and the price per gallon after 10 gallons were lost is $\frac{75}{8} \text{ dol} = 1 \text{ dol} \quad 29\frac{3}{8} \text{ c}$

$$\begin{array}{r} \text{dol} \quad \text{dol} \quad \text{dol} \\ 100 : \frac{75}{8} :: 110 : \frac{11 \times 75}{10 \times 58} = \frac{11 \times 15}{2 \times 58} = \\ 1 \text{ dol} \quad 42\frac{7}{8} \text{ c} \end{array}$$

109. Bought 60 barrels of flour at 12 dollars a barrel, and sold 20 barrels at 14 dollars, and 20 at 13 dollars a barrel; how must I sell the rest to gain 20 per cent by the whole?

100 *dol* : 720 *dol* (prime cost) :: 120 *dol* : 864 *dol*
the price at 20 per cent profit.

$20 \times 14 + 20 \times 13 = 540$ the price of the two first lots.

Hence the price of the third lot is $16\frac{1}{2} \text{ dol}$ a barrel

110. A person bought a quantity of wine for 165 *l* 15 *s* at 4 *s* 3 *d* a gallon; but some of it being damaged, he sold the rest for 110 *l* 16 *s* 8 *d* at 6 *s* 4 *d* a gallon. How many gallons were damaged?

$$\begin{array}{r} \text{s} \quad \text{d} \quad \text{gal} \quad \text{1} \quad \text{s} \quad \text{d} \quad \text{gal} \\ 4 \quad 3 : 1 :: 165 \quad 15 : 780 \\ 6 \quad 4 : 1 :: 110 \quad 16 \quad 8 : 350 \end{array}$$

430 *Ans*

111. A

111. A person lent a certain sum of money at 5*l* per cent, simple interest, and at the end of 8 years received 630*l*, which was the amount of principal and interest. Required the principal?

The amount of 100*l* in 8 years at 5*l* per cent, simple interest, is 140*l*, therefore,

$$\begin{array}{ccccccc} l & & l & & l & & l \\ 140 & : & 100 & :: & 630 & : & 450 \end{array}$$

112. A and B entered into partnership; A contributed 1500 dollars on the first of January, but B could contribute nothing till the first of May. What must B contribute that he may have an equal share of the profit at the end of the year?

$$\begin{array}{ccccccc} mo & & dol & & mo & & \\ 12 & : & 1500 & :: & 8 & : & \frac{3 \times 1500}{2} = 2250 dol \end{array}$$

113. How much sugar at 15*c* per *lb* must be given for 5*cwt* of tobacco at 15 dollars per *cwt*?

The price of the tobacco is 75 *dol*

$$\begin{array}{ccccccc} c & & lb & & dol & & \\ 15 & : & 1 & :: & 75 & : & \frac{75 \times 100}{15} = 500 lb \end{array}$$

114. A merchant barter 1000 yards of canvass at 1*s* 2*d* per yard for linen at 3*s* 7*d* per yard. How many yards of linen must he receive?

The price of the canvass is 14000 *d*

$$\begin{array}{ccccccc} d & & yd & & d & & yds \\ 42 & : & 1 & :: & 14000 & : & 333\frac{1}{3} \end{array}$$

115. A person gives 3 *hhd* of brandy at 2 dollars a gallon for 130 yards of cloth. What was the cloth a yard?

Ans. 2 *dol* 90 $\frac{10}{11}$ *c*

116. A and B barter; A has 400 bushels of corn at 4*s* a bushel, for which B gives him 40*l* in money, and the rest in cyder at 1*s* a gallon. How much cyder must A receive?

The price of the corn is 80*l*

$$\begin{array}{ccccccc} s & & gal & & l & & s & & gal \\ 1 & : & 1 & :: & 40 & = & 800 & : & 800 \end{array}$$

117. A and B barter; A has 150 barrels of flour at 10 dollars a barrel, and B has 8 pipes of wine at $1\frac{1}{2}$ dollar a gallon. Which must receive money, and how much?

Ans. B 12 *dol*

118. How much money of America is equal to 100 *l* English, supposing 4 *s* 6 *d* English equal to 6 *s* American?*

$$\begin{array}{ccccccc} s & & s & & l & & \\ 4\frac{1}{2} & : & 6 & :: & 100 & : & \frac{6 \times 100 \times 2}{9} = \frac{400}{3} = 133\frac{1}{3} \\ & & 6\text{ s } 8\text{ d} & & & & \end{array}$$

119. Bought 40 pieces of cotton, each piece containing 24 yards, for 24 *s* sterling a piece, and sold the whole at 2 *s* a yard, American money. Required the gain supposing 4 *s* 6 *d* British money equal to 6 *s* American.

Ans. 24 *l* British, or 32 *l* American

120. Bought 20 *bhd* of rum for 15 *l* 15 *s* sterling per *bhd*, and sold it at $1\frac{1}{2}$ dollar a gallon. Required the gain.

It was sold for $94\frac{1}{2}$ *dol* per *bhd*

$$\begin{array}{ccccccc} dol & & s & & dol & & l \quad s \quad d \\ 1 & : & 4\frac{1}{2} & :: & 94\frac{1}{2} & : & 21 \quad 5 \quad 3 \end{array}$$

Therefore the gain per *bhd* is 5 *l* 10 *s* 3 *d*, and consequently the whole gain 110 *l* 5 *s* British.

$$\begin{array}{ccccccc} s & & dol & & l & & s \\ 4\frac{1}{2} & : & 1 & :: & 110 & 5 & = 2205 \\ & & & & & & 9 \end{array} \quad \frac{2205 \times 2}{9} =$$

245 $\times 2 = 490$ *dol* the gain.

121. What is the purchase of 1200 *l* bank stock at $103\frac{1}{8}$ per cent?

$$\begin{array}{ccccccc} l & & l & & l & & s \\ 100 & : & 103\frac{1}{8} & :: & 1200 & 1243 & 10 \end{array}$$

122. Required the purchase of 2380 *dol* stock at 110 $\frac{1}{2}$ per cent.

Ans. 2629 *dol* 90 *c*

123. Required

* Add one third of British money to itself, and the sum is N. England money; or subtract one fourth of itself from N. England money, and the remainder is British money.

123. Required the commission of 6985 *dol* at $2\frac{1}{2}$ per cent.

$$\begin{array}{ccccccc} \text{dol} & & \text{dol} & & \text{dol} & & \text{dol} & c \\ 100 & : & 2\frac{1}{2} & :: & 6985 & : & 153 & 67 \end{array}$$

124. A merchant ships goods to the amount of 10000 dollars; what sum must he insure to cover his adventure, premium 15 per cent?

$$\begin{array}{ccccccc} \text{dol} & & \text{dol} & & \text{dol} & & \text{dol} \\ 85 & : & 100 & :: & 10000 & : & 11764\frac{1}{4} \end{array}$$

125. What sum will cover 700 *l*, premium 5 per cent?

Ans. 736 *l* 16 *s* 10 $\frac{2}{3}$ *d*

F E L L O W S H I P

IS a rule which teaches to divide a given number into any number of parts that shall have any assigned proportion to one another.

By this rule several persons trading in partnership are enabled to determine their respective shares of the gain or loss; also a person's estate may be divided among his creditors, and legacies adjusted when there is a deficiency of effects.

Fellowship is divided into two sorts, single and double.

Single fellowship is when different stocks are employed for the same time. Double fellowship is when the same or different stocks are employed for different times.

S I N G L E F E L L O W S H I P.

RULE. As the sum of the proportional numbers, or the whole stock

: the given number to be divided,

:: each proportional number,

: the corresponding part of the given number.

To

To divide 120 into three parts which are in proportion to one another as the numbers 1, 2, 3.

Here 120 is the number to be divided, and 6 is the sum of the numbers 1, 2, 3, which express the proportions of the parts ; therefore, as

$$\begin{array}{lcl} 6 : 120 :: & \left\{ \begin{array}{l} 1 : 20 \text{ the first part} \\ 2 : 40 \text{ the 2d part} \\ 3 : 60 \text{ the 3d part} \end{array} \right. \\ \text{or } 1 : 20 :: & \end{array}$$

Two partners, A and B, formed a joint stock ; A contributed 750*l* and B 450*l*; and they gained 300*l*. Required their shares of the gain.

$$\begin{array}{lcl} 1200 : 300 :: & \left\{ \begin{array}{l} 750 : 180\text{ } 15s = \text{A's share} \\ 450 : 120\text{ } 5s = \text{B's share} \end{array} \right. \\ \text{or } 4 : 1 :: & \end{array}$$

A and B entered into partnership and gained 450*l* ; A's share was three times as much as B's. Required the share of each.

Suppose A's share to B's as 3 to 1 ; then

$$4 : 450 :: \left\{ \begin{array}{l} 3 : 337\text{ } 10s = \text{A's share} \\ 1 : 112\text{ } 10s = \text{B's share} \end{array} \right.$$

A, B, C, entered into partnership for 5 years, and at the end of that time the partnership was dissolved, and they had gained 8000*l*. A advanced 9000*l*, B 7000*l*, C 4000*l*. Required the gain of each.

Ans. A's share 3600*l*, B's 2800*l*, C's 1600*l*

A ship worth 8600 *dol* was lost, and 5000 *dol* of it insured. $\frac{1}{4}$ of it belonged to A, $\frac{1}{4}$ to B, and the rest to C. Required the loss of each.

$8600 - 5000 = 3600 = \text{the whole loss, and } 1 - \frac{1}{4} - \frac{1}{4} = \frac{1}{2} = \text{what belonged to C.}$

$$\begin{array}{lcl} & \text{\textit{dol}} & \\ 1 : 3600 :: & \left\{ \begin{array}{l} \frac{1}{4} : 900 = \text{A's loss} \\ \frac{1}{4} : 900 = \text{B's} \\ \frac{1}{2} : 1800 = \text{C's} \end{array} \right. & \end{array}$$

A person owes to A 2750 *dol* 50 *c*, to B 3040 *dol* 25 *c*, to C 1520 *dol*, to D 1040 *dol* 75 *c* ; and his effects are only 6750 *dol* 60 *c*. How much must each receive ?

Ans. A 2223 $\frac{2}{3}$ *dol*, B 2457 $\frac{1}{3}$ *dol*, C 1228 $\frac{1}{4}$ *dol*, D 840 $\frac{1}{2}$ *dol*

DOUBLE

DOUBLE FELLOWSHIP.

RULE. Multiply each particular share of the stock by the time of its continuance, and add all the products together ; then,

As the sum of the products is to the whole gain or loss, so is each product to the corresponding part of the gain or loss.

Two merchants entered into partnership ; A advanced 600 *dol* for 4 months, and B 500 *dol* for 5 months, and they gained 240 *dol*. Required the gain of each.

$$600 \times 4 = 2400, \quad 500 \times 5 = 2500$$

$$2400 + 2500 = 4900 : 240 :: \left\{ \begin{array}{l} 2400 : 117 \text{ dol } 55 \frac{3}{4} c \\ = \text{A's share} \\ \text{or } 490 : 24 :: \left\{ \begin{array}{l} 2500 : 122 \text{ dol } 44 \frac{4}{9} c \\ = \text{B's share} \end{array} \right. \end{array} \right.$$

Three men hired a piece of land for 60 *l* 10 *s* ; A put into it 5 cattle for 4½ months, B 8 for 5 months, and C 9 for 6½ months. How much of the rent must each pay ?

$$22 \frac{1}{2} + 40 + 58 \frac{1}{2} = 121 : \frac{121}{2} :: \left\{ \begin{array}{l} \frac{4}{2} : 11 \text{ l } 5 \text{ s} = \text{A's share} \\ 40 : 20 \text{ l} = \text{B's} \\ \text{or } 2 : 1 :: \left\{ \begin{array}{l} \frac{1}{2} : 29 \text{ l } 5 \text{ s} = \text{C's} \end{array} \right. \end{array} \right.$$

DISCOUNT

IS an allowance made for the payment of any sum of money before it becomes due, according to a certain rate per cent ; and is equal to the difference between the debt and its present worth.

The present worth of any sum or debt due some time hence is such a sum as, if put to interest, would in that time and at the rate per cent for which the discount is to be made, amount to the sum or debt then due.

RULE.

RULE. As the amount of 100 *l*, 100 *dol*, &c. for the given rate and time is to the interest of 100 *l*, &c. for that time, so is the given sum or debt to the discount required.

Subtract the discount from the given sum, and the remainder is the present worth.

Required the discount of 500 *dol* payable in half a year at 6 per cent.

$$103 : 3 :: 500 : 14 \text{ dol } 56 \frac{32}{100} \text{ c the discount required}$$

Required the discount and present worth of 760 *dol* payable in 9 months at 6½ per cent.

$$\begin{array}{c} \text{mo} \quad \text{dol} \quad \text{mo} \\ 12 : 12 :: 9 : \frac{3 \times 13}{4 \times 2} = 4 \frac{7}{8} \text{ dol the interest} \\ \text{of 100 dol in 9 mo} \end{array}$$

$$104 \frac{7}{8} : 4 \frac{7}{8} :: 760 : \frac{19 \times 760}{839} = 17 \text{ dol } 21 \frac{818}{1000} \text{ c the discount required}$$

$$760 - \frac{14440}{839} = \frac{623200}{839} = 742 \text{ dol } 78 \frac{718}{1000} \text{ c the present worth}$$

A person bought a quantity of goods for 150 *l* ready money, and sold them for 200 *l* payable in 9 months. Required the gain, discount at 5 per cent.

$$103 \frac{1}{4} : 3 \frac{1}{4} :: 200 : \frac{15 \times 200}{415} = \frac{3 \times 200}{83} = \frac{600}{83} = \text{discount of } 200 \text{ l}$$

$$200 - \frac{600}{83} = \frac{16000}{83} \text{ the present worth of } 200 \text{ l}$$

$$\frac{16000}{83} - 150 = \frac{3550}{83} = 42 \text{ l } 15 \text{ s } 5 \frac{1}{11} \text{ d the gain required}$$

Required

Required the present worth of 75 £ due 15 months hence, discount at 6 per cent.

$$100 \frac{1}{2} : \frac{1}{2} :: 75 : \frac{15 \times 75}{215} = \frac{225}{43} \text{ the}$$

discount $\therefore 75 - \frac{225}{43} = 69 \text{ £ } 7 \text{ dol } 67 \text{ c}$ the present worth

EQUATION OF PAYMENTS

TEACHES to find a time for the payment of several debts due at different times, so that neither debtor nor creditor may sustain any loss.

RULE. Multiply each payment by the time at which it is due, and divide the sum of the products by the sum of the payments; the quotient will be the time required.

A owes B 2340 *dol* to be paid, 1340 in 6 months, 500 in 7 months, and 500 in 9 months. Required the equated time to pay the whole.

$$1340 \times 6 = 8040$$

$$500 \times 7 = 3500$$

$$500 \times 9 = 4500$$

$$\hline 16040$$

$$\hline = 6 \text{ mo } 23 \text{ d } 22 \text{ h}$$

$$2340$$

A debt of 1200 *l* is to be paid, 500 *l* in 2 months, 400 *l* in 5 months, and the rest in 7 months. Required the equated time to pay the whole.

Ans. $4\frac{1}{2}$ mo

A certain debt is to be paid as follows: $\frac{1}{4}$ in 2 months, and $\frac{1}{4}$ every 2 months after. Required the equated time to pay the whole.

Since no particular sum is mentioned, the debt may be represented by 1; then $\frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{1}{2} + 1 + \frac{1}{2} + 2 = 5 \text{ mo}$

APPENDIX.

APPENDIX.

THE following table properly belongs to Mensuration, and is inserted here because it may be useful on some occasions.

SQUARE MEASURE.

144 square inches	make 1 square foot
9 feet	1 yard
30 $\frac{1}{2}$ yards	1 pole
40 poles	1 rood
4 roods	1 acre

<i>sq. in</i>	<i>sq. f</i>	<i>sq. yd</i>	<i>sq. p</i>	
144 =	1	1		
1296 =	9 =	1		
39204 =	272 $\frac{1}{4}$ =	30 $\frac{1}{2}$ =	1	ro
1568160 =	10890 =	1210 =	40 =	1 a
6272640 =	43560 =	4840 =	160 =	4 = 1

By this measure are measured land, husbandmen's and gardener's work, board, glass, and all artificer's work, where both length and breadth are concerned.

When length, breadth, and depth are concerned, it is called solid or cubical measure, which is used in measuring solid bodies, as timber, stone, &c.

1728 solid inches make 1 solid foot, and 27 solid feet 1 solid yard.

To reduce pounds and shillings to dollars and cents, and dollars to pounds and shillings N. England money.

1. Annex a cypher to the pounds, and divide by 3; the remainder, if any, will be either 2 s or 4 s (that is, 33 $\frac{1}{3}$ c or 66 $\frac{2}{3}$ c), which must be added to the shillings, and the sum divided

vided by 6. Add the latter quotient to the former; the sum will be dollars, and the last remainder shillings, which may be reduced to cents by annexing two cyphers and dividing by 6.

2. Multiply the dollars by 3, and double the figure in the units' place of the product. The figures on the left are pounds, and the figure doubled is shillings.

In 37 l 15 s how many dollars at 6 s ?

$$\begin{array}{r} 3 \overline{)370} \\ \underline{123} \\ 247 \end{array} \quad \begin{array}{r} 15 \\ \underline{6)17} \\ 2 \end{array} \quad \begin{array}{l} \frac{1}{3} \text{ dol} = 2 \text{ s} \\ 5 \text{ s} = 83\frac{1}{3} \text{ c} \\ \text{Ans. } 125 \text{ dol } 83\frac{1}{3} \text{ c} \end{array}$$

In 125 dol how many pounds ?

$$\begin{array}{r} 125 \\ \underline{3} \\ 37 \overline{)5} \\ \underline{12} \\ 10 \end{array} \quad \text{Ans. } 37 \text{ l } 10 \text{ s}$$

In 120 l 10 s how many dollars ? *Ans. 401 dol 66 $\frac{2}{3}$ c*

In 803 $\frac{1}{3}$ dol how many pounds ? *Ans. 241 l*

MISCELLANEOUS QUESTIONS.

REQUIRED the sum of 3397, 14, 96123, 725, 341 1829, 6, 723485. *Ans. 825813*

How much is A older than B, A being born in the year 1742 and B in 1781 ? *Ans. 39 years*

Required the product of 16358724 multiplied by 704006. *Ans. 11516639848344*

Divide 74638105 by 37. *Ans. 2017246 $\frac{1}{3}$*

Reduce 351 l 13 s 0 $\frac{1}{2}$ d to farthings. *Ans. 337587*

Reduce 7856432 farthings to pounds. *Ans. 8183 l 15 s 8 d*

Reduce

Reduce 340157 gr troy to lb. *Ans.* 59 lb 13 dwt 5 gr

Reduce 59 lb 13 dwt 5 gr troy to grains. *Ans.* 340157

Reduce 9 cwt 5 lb to ounces. *Ans.* 16208

Reduce 16208 oz avoird. to cwt. *Ans.* 9 cwt 5 lb

Reduce 2 m 1 fu 8 p 3 y 2 in to inches. *Ans.* 136334

Reduce 136334 in to miles. *Ans.* 2 m 1 fu 47 y 2 in

Reduce 10 a 1 r 12 p to poles. *Ans.* 1652

Reduce 1652 p to acres. *Ans.* 10 a 1 r 12 p

Reduce 13 t 1 p 1 hhd 17 gal 5 pt to pints. *Ans.* 27861

Reduce 2 hhd 1 bar 20 gal 4 pt of beer to pints. *Ans.* 1316

Reduce 1316 pt of beer to hogsheds. *Ans.* 2 hhd 1 bar 20 gal 4 pt

Reduce 35 qr 3 buf to quarts. *Ans.* 9056

Reduce 2551500" to days. *Ans.* 29 d 12 h 45'

A owes B the following sums for different articles. For wine 14 l 7 s 5 d, for cheese 8 l 19 s 2½ d, for butter 5 l 3 s 4½ d, for cyder 21 l 2 s 9 d, for tea 7 l 16 s 8½ d, for coffee 4 s 3 d. Required the whole debt.

l	s	d	Beginning at the right hand I say, 2 and
14	7	5	2 are 4, and 11 are 5. How oft 4 in 5;
8	19	2½	once and 1 over; so I set down 1 far and
5	3	4½	carry 1 to the pence. Then I say 1 (car-
21	2	9	ried) and 3 are 4, and 8 are 12, and 9 are
7	16	8½	21, and 4 are 25, and 2 are 27, and 5 are
4	3		32. How oft 12 in 32; twice 12 are 24
<hr/>			and 8 over; so I set down 8 d and carry 2
57	13	8½	to the shillings. Then I say, 2 and 4 are
			6, and 6 are 12, and 2 are 14, and 3 are
			17, and 9 are 26, and 7 are 33. How oft 10 in 33; 3
			times and 3 over; so I set down 3 and carry 3 to the
			next column of shillings. Again, I say, 3 and 1 are 4, and
			1 are 5. The half of 5 is 2, and 1 over; so I set down
			1 on the left side of 3, and carry 2 to the pounds, which
			are added like simple numbers.*

G 2

Required

* An explanation of the operation was accidentally omitted in the proper place, and therefore is given here.

Required the sum of 23 lb 6 oz 5 dwt troy, 41 lb 7 oz 17 dwt, 12 lb 15 dwt, 2 lb 7 oz, 13 lb, 7 lb 17 dwt.

Ans. 99 lb 10 oz 14 dwt

Required the sum of 3 qr 14 lb, 1 qr 23 lb, 3 cwt 2 qr 5 lb, 2 qr 3 lb 13 oz, 13 cwt 1 qr 24 lb, 3 cwt 17 lb 7 oz.

Ans. 22 cwt 3 lb 4 oz

Required the sum of 123 yds 2 f 5 in, 12 yds 1 f 9 in, 2 f 6 in, 54 yds 11 in.

Ans. 191 yds 1 f 7 in

Required the sum of 1 t 3 hhd of wine, 3 hhd 47 gal, 1 hhd 5 gal, 2 hhd 23 gal.

Ans. 3 t 2 hhd 12 gal

Required the sum of 3 d 20 h 50' 40", 5 d 15 h 32' 23", 22 h 45' 48".

Ans. 10 d 11 h 8' 51"

Required the sum of 13 a 3 r 14 p, 27 a 29 p, 19 a 1 r 3 r 34 p, 45 a 2 r 11 p.

Ans. 106 a 3 r 8 p

	l	s	d	
From	103	13	2½	Here I say, 3 from 6. (suppo-
Take	71	14	5½	sing 4 to be added to 2) and 3 re-
				mains, 5 from 13 and 8 remains,
				4 from 12 and 8 remains, 1 from
	31	18	8½	2 and 1 remains, 1 from 2 and 1
				remains, 7 from 10 and 3 remains.

The several remainders are set down as you see in the example.*

From 7 lb 3 oz 14 dwt 11 gr take 3 lb 7 oz 5 dwt 19 gr.

Ans. 3 lb 8 oz 8 dwt 16 gr

From 5 cwt 17 lb take 3 cwt 2 q 11 lb.

Ans. 1 cwt 2 q 6 lb

From 17 a 1 r 14 p take 9 a 3 r 6 p.

Ans. 7 a 2 r 8 p

Required the value of 3375 a.

Ans. 1 r 14 p

Required the value of 625 s.

Ans. 7½ d

Required the value of 625 cwt.

Ans. 2 q 14 lb

Reduce 9 d to the decimal of 1 l.

Ans. .0375 l

Reduce 7½ d to the decimal of 1 s.

Ans. .625 s

Reduce 3 cwt 2 q 14 lb to cwt.

Ans. 3.625 cwt

Reduce 13 a 1 r 14 p to acres.

Ans. 13.3375 a

* The explanation was accidentally omitted in the proper place.

If $\frac{2}{3}$ of any thing cost $\frac{1}{3}l$, what will $6\frac{1}{4}$ cost?

$$\frac{2}{3} : \frac{1}{3}l :: 6\frac{1}{4} = \frac{27}{4} : \frac{1}{3} \times \frac{27}{4} \times \frac{3}{2} = \frac{27}{8} \\ = 3l\ 7s\ 6d$$

If $\frac{5}{7}$ cwt cost $\frac{11}{12}l$, what will 1 cwt cost?

$$\begin{array}{ccccc} \text{cwt} & l & \text{cwt} & & \\ \frac{5}{7} : \frac{11}{12} :: 1 : \frac{11}{12} \times \frac{7}{5} = 1l\ 5s\ 8d \end{array}$$

If $\frac{3}{8}$ of an estate be estimated at 1000 l 15 s , what is the value of the whole estate?

$$\frac{3}{8} : 1000\frac{1}{2}l :: 1 : \frac{4003}{4} \times \frac{8}{3} = 2668l\ 13s\ 4d$$

If $\frac{5}{8}$ of a gallon cost 6 s 3 d , what will $\frac{5}{9}$ of a tun cost?

$$6s\ 3d = \frac{25}{4}s = \frac{5}{16}l, \frac{5}{9}l = \frac{5 \times 25^2}{9}gal = 5 \times \\ 28 = 140$$

$$\begin{array}{ccccc} \text{gal} & l & \text{gal} & & \\ \frac{5}{8} : \frac{5}{16} :: 140 : \frac{140 \times 5 \times 8}{16 \times 5} = 70l \end{array}$$

A mercer bought $3\frac{1}{2}$ pieces of silk, each piece containing $24\frac{1}{2}$ yards, at 5 s 9 d a yard. Required the price of the whole.

$$\begin{array}{ccccc} \text{yd} & s & \text{yds} & & \\ 1 : 5\frac{1}{2} :: 3\frac{1}{2} \times 24\frac{1}{2} = \frac{511}{6} : \frac{511}{6} \times \frac{23}{4} \\ = 24l\ 9s\ 8\frac{1}{2}d \end{array}$$

What quantity of shalloon that is $\frac{1}{2}$ yard wide will line $9\frac{1}{2}$ yards of cloth that is $2\frac{1}{2}$ yards wide?

$$\begin{array}{ccccc} \text{yds wide} & \text{yds long} & \text{yd wide} & & \text{yds long} \\ 2\frac{1}{2} : 9\frac{1}{2} :: \frac{1}{2} : \frac{19}{2} \times \frac{5}{2} \times \frac{4}{3} = 31\frac{1}{3} \end{array}$$

If a loaf of bread of which the price is 6 cents, weigh $12\frac{1}{2}$ oz when wheat is $1\frac{1}{4}$ dol a bushel, what should it weigh when wheat is $1\frac{1}{2}$ dol a bushel?

$$\begin{array}{ccccc} \text{dol} & \text{oz} & \text{dol} & & \\ 1\frac{1}{4} : 12\frac{1}{2} :: 1\frac{1}{2} : \frac{25}{2} \times \frac{5}{4} \times \frac{2}{3} = 10\frac{5}{12} \text{oz} \end{array}$$

If a person perform a journey in $5\frac{1}{2}$ days when the day is $12\frac{1}{2}$ hours long, in how many days can he perform the same journey when the day is $9\frac{1}{4}$ hours long?

$$\begin{array}{c} b \\ 12\frac{1}{2} \end{array} : \begin{array}{c} d \\ 5\frac{1}{2} \end{array} :: \begin{array}{c} b \\ 9\frac{1}{4} \end{array} : \frac{11}{2} \times \frac{25}{2} \times \frac{4}{39} = 7\frac{3}{10} \text{ days}$$

Required the interest of $273\frac{1}{2}$ dol at $6\frac{1}{4}$ per cent per ann.

$$\begin{array}{c} \text{dol} \\ 100 \end{array} : \begin{array}{c} \text{dol} \\ 6\frac{1}{4} \end{array} :: \begin{array}{c} \text{dol} \\ 273\frac{1}{2} \end{array} : \frac{25}{4} \times \frac{547}{2} \times \frac{1}{100} = \frac{547}{4 \times 2 \times 4} = 17\frac{1}{8} \text{ dol}$$

Required the value of $\frac{2}{3}$ of a house which cost 1200 dol
75 c.

$$1 : 1200\frac{1}{4} :: \frac{2}{3} : \frac{4803}{4} \times \frac{2}{5} = 480 \text{ dol } 30 \text{ c}$$

Required the price of 10 lb 8 oz of cinnamon at 25 c per oz.

$$\begin{array}{c} \text{oz} \\ 1 \end{array} = \frac{1}{16} : \frac{1}{4} :: \begin{array}{c} \text{lb} \\ 10\frac{1}{2} \end{array} : \frac{1}{4} \times \frac{21}{2} \times 16 = 42 \text{ dol}$$

The expense of making a canal is 56000 dol, and is divided into 500 shares. What is the expense of $25\frac{1}{2}$ shares?

$$500 : 56000 \text{ dol} :: 25\frac{1}{2} : 112 \times 25\frac{1}{2} = 2822 \text{ dol } 40 \text{ c}$$

$32\frac{1}{2}$ yards of fatten were sold to three persons at 2 dol 60 c a yard. Required the price of $\frac{1}{3}$ of the whole.

$$\begin{array}{c} \text{yd} \\ 1 \end{array} : \begin{array}{c} \text{dol} \\ 2\frac{1}{2} \end{array} :: \frac{1}{3} \times \begin{array}{c} \text{yds} \\ 32\frac{1}{2} \end{array} : \frac{13}{5} \times \frac{65}{6} = 13 \times \frac{13}{6} = 28\frac{1}{2} \text{ dol}$$

If the taxes be laid at $\frac{4}{5}$ of the rent, and a house pay 8 l 10 s at 5 s in the pound, what is the annual rent?

$$\frac{1}{4} \text{ l} : 1 \text{ l} :: 8\frac{1}{2} \text{ l} : 34 \text{ l the assessment}$$

$$\frac{4}{5} : 34 \text{ l} :: 1 : 42\frac{1}{2} \text{ l the rent}$$

A man

A man left 2850*l* to his widow, 2 sons, and a daughter ; the widow was to have $\frac{1}{3}$, the elder son $\frac{1}{4}$, the younger $\frac{1}{5}$, and the daughter $\frac{1}{6}$. Required the portion of each.

$$\frac{1}{3} + \frac{1}{4} + \frac{1}{5} + \frac{1}{6} : 2850 \text{ } l :: \left\{ \begin{array}{l} \frac{1}{3} \\ \frac{1}{4} \\ \frac{1}{5} \\ \frac{1}{6} \end{array} \right\} : \begin{array}{l} 1000 \\ 750 \\ 600 \\ 500 \end{array}$$

A, B, C are to share 100*l* in the proportion of $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$ respectively. Now if C die, how must the money be divided between the other two ?

$$\frac{1}{3} + \frac{1}{4} + \frac{1}{5} : 100 \text{ } l :: \left\{ \begin{array}{l} \frac{1}{3} \\ \frac{1}{4} \\ \frac{1}{5} \end{array} \right\} : \begin{array}{l} 42\frac{2}{3} = \text{A's share} \\ 31\frac{1}{4} = \text{B's} \\ 25\frac{1}{5} = \text{C's} \end{array}$$

$$\text{Again, } \frac{1}{3} + \frac{1}{4} : 25\frac{1}{5} :: \frac{1}{3} : 14\frac{3}{5}$$

$$\text{Then } 42\frac{2}{3} + 14\frac{3}{5} = 57 \text{ } l \text{ } 2 \text{ } s \text{ } 10\frac{1}{2} \text{ } d = \text{A's share}$$

$$\therefore 100 - 57 \text{ } l \text{ } 2 \text{ } s \text{ } 10\frac{1}{2} \text{ } d = 42 \text{ } l \text{ } 17 \text{ } s \text{ } 1\frac{1}{2} \text{ } d = \text{B's}$$

A person has $\frac{2}{3}$ of a ship, and sells $\frac{1}{3}$ of his property for 375*l*. Required the value of the ship.

$$\frac{2}{3} \times \frac{1}{3} = \frac{2}{9} : 375 :: 1 : 1500$$

A advanced 2000 *dol*, B and C 8500 *dol* ; they gained 6300 *dol*, and B's share was 2100 *dol*. What did A and C gain, and B and C advance ?

$$10500 : 6300 (5 : 3) :: 2000 : 1200 \text{ A's gain}$$

$$\therefore 3000 = \text{C's gain}$$

$$6300 : 10500 (3 : 5) :: 3000 : 5000 \text{ C's stock}$$

$$\therefore 3500 = \text{B's stock}$$

A, B, C entered into partnership ; A advanced 2000*l*, B 3000*l*, and C a sum unknown ; they gained 3600*l*, and C's share was 1600*l*. What did A and B gain, and C advance ?

$$2000 \text{ } l = \text{share of A and B}$$

$$5000 : 2000 (5 : 2) :: 2000 : 800 \text{ A's gain}$$

$$\therefore 1200 = \text{B's gain}$$

$$800 : 2000 (4 : 10) :: 1600 : 4000 \text{ C's stock}$$

A and

A and B entered into partnership; A advanced 157 $\frac{1}{2}$ $\text{\$}$, and received $\frac{5}{8}$ of the gain. How much did B advance?

$$\frac{1}{8} : 157\frac{1}{2} :: \frac{5}{8} : 788\frac{1}{2}$$

Required the interest of 987 $\frac{1}{2}$ $\text{\$}$ for 30 weeks at 6 $\frac{1}{2}$ per cent.

$$\begin{array}{l} \text{w} \quad \text{c} \quad \text{w} \\ 52 : 650 :: 30 : \frac{19500}{52} = \text{the interest of } 100 \\ \text{dol in 30 weeks} \end{array}$$

$$\begin{array}{l} \text{dol} \quad \text{c} \quad \text{dol} \\ 100 : \frac{19500}{52} :: 987\frac{1}{2} : \frac{195 \times 1975}{52 \times 2} = \\ \frac{15 \times 1975}{4 \times 2} = 37 \text{ dol } 3\frac{1}{2} \text{ c} \end{array}$$

Required the interest of 520 $\text{\$}$ for 9 months at 5 $\frac{1}{2}$ per cent.

$$\begin{array}{l} \text{mo} \quad \text{l} \quad \text{mo} \\ 12 : 5\frac{1}{2} :: 9 : \frac{11 \times 3}{2 \times 4} = 4 \text{ l } 2 \text{ s } 6 \text{ d} \\ \text{the interest of } 100 \text{ l in 9 mo} \\ \text{l} \quad \text{l} \\ 100 : \frac{33}{8} :: 520\frac{1}{2} : \frac{33 \times 1041}{8 \times 100 \times 2} = \frac{34359}{1600} \\ = 21 \text{ l } 9 \text{ s } 4\frac{1}{2} \text{ d} \end{array}$$

$$\begin{array}{l} \text{mo} \quad \text{l} \quad \text{mo} \\ \text{Or, } 12 : 5\frac{1}{2} :: 9 : \frac{5\frac{1}{2} \times 3}{4} = 4\frac{1}{2} \text{ l the} \\ \text{interest of } 100 \text{ l in 9 mo} \\ 100 \text{ l} : 4\frac{1}{2} \text{ l} :: 520\frac{1}{2} \text{ l} : 21\frac{470625}{1600} = \\ 21 \text{ l } 9 \text{ s } 4\frac{1}{2} \text{ d} \end{array}$$

Required

Required the interest of 860 *dol* 25 *c* for 60 days at 5 per cent.

$$\begin{array}{l} \text{days} \quad \text{dol} \quad \text{days} \\ 365 : 5 :: 60 : \frac{5 \times 60}{365} = \frac{60}{73} \text{ dol the interest} \\ \text{of 100 dol in 60 days} \end{array}$$

$$\begin{array}{l} \text{dol} \quad \text{c} \quad \text{dol} \\ 100 = 10000 : \frac{60}{73} :: 86025 : \frac{60 \times 86025}{73 \times 10000} \\ = \frac{3 \times 86025}{73 \times 500} = \frac{3 \times 17205}{73 \times 100} = \frac{51615}{7300} = 7 \text{ dol } 7\frac{4}{73} \text{ c} \end{array}$$

Required the difference between the interest and discount of 500 *dol* for 8 months at 6 per cent.

The interest is 20 *dol*, and the discount is 19 *dol* 23 *c* ∴ the difference required is 77 *c*

Required the present worth of two notes, one note for 40 *l* payable in 3 months, the other for 72 *l* payable in 9 months, discount at 6 per cent.

Ans. 108 *l* 6 *s* 2 *d*

Sold goods for A. B. amounting to 5430 *dol*. What is my commission at 2½ per cent?

Ans. 135 *dol* 75 *c*

BOOK KEEPING

BY THE METHOD OF SINGLE ENTRY.

DAY BOOK.

		1796	Mr. James Austin Dr.	deb c	cred c
Jan. 1	To	15	gal of brandy	at 1 50	22 50
		16	rum	1 25	20
		17	madeira	2	34
					<hr/> 76 50
		Mr. John Baker Dr.			
3	To	26½	cwt of cheese	at 9 50	194 75
		26	bread	7 25	188 50
		35½	barrels of flour	10	355
		29	beef	10 50	304 50
		31	firkins of butter	8 50	263 50
					<hr/> 1306 25
		Mrs. Mary Russell Dr.			
4	To	38½	yards of broad cloth	at 5 50	211 75
		24	Irish linen	75	18
		7½	cambric	1 50	11 6½
		11½	callico	87½	10 38½
		56½	flowered silk	4 60	261 5
					<hr/> 512 24½
		Mr. William Johnson Dr.			
10	To	48	yards of Yorkshire cloth	at 2 25	108
		72	fine Spanish black	3	216
		96	fine grey cloth	2 75	264
		21	frize	90	18 90
					<hr/> 606 90

Mr.

BOOK KEEPING.

81

1796	Mr. Thomas Marriot Dr.					
		<i>cwt q lb</i>	<i>dol c</i>		<i>dol c</i>	
Jan. 25	To sugar,	17 2 17	at 10 80 per cwt	190	63	
	tobacco,	4 12	14	57	50	
	raisins,	12 1 19	11 20	139	10	
				387	23	
<hr/>						
	Mr. John Baker Dr.					
		<i>cwt q lb</i>				
Feb. 2	To 4 3 24 of cheese at 8 50 per cwt			42	19	
	4 2 10 do 9			41	30	
	5 1 18 tallow 8			43	28	
				126	77	
<hr/>						
	Mrs. Jane Mason Dr.					
6	To 132 yards of linen at 67			88	44	
	144 fatten 2 50			360		
	345 sheeting 37½			129	37½	
				577	81½	
<hr/>						
	Mr. Samuel Hobson Dr.					
10	To 252 gal of brandy at 1 25			315		
	126 rum 1 12½			141	75	
	504 rhenish wine 2			1008		
				1464	75	
<hr/>						
	Mr. George Jackson Dr.					
20	To 751½ barrels of flour at 9 50			7139	25	
	530 pork 15			7950		
	178 beef 10 50			1869		
				16958	25	
<hr/>						
	Miss Fanny Jarvis Dr.					
24	To 15 oz of nutmegs at 75			11	25	
	25½ lb of coffee 25			6	37½	
				17	62½	

H

Mrs.

1796	Mrs. Elizabeth Gregory Dr.				
			<i>dol c</i>	<i>dol c</i>	
March 1	To 24 $\frac{1}{2}$ lb of green tea	at 2		49	
	21 $\frac{1}{2}$ bohea		75	15	93 $\frac{1}{2}$
	35 $\frac{3}{4}$ fouchon	1		35	75
	137 loaf sugar		25	34	25
				134	93 $\frac{1}{2}$
<hr/>					
	Mr. James Austin Dr.				
9	To 24 mahogany chairs	at 7 25		174	
	2 elbow do	8		16	
	4 pier glasses	10		40	
				230	
<hr/>					
	Miss Fanny Jarvis Dr.				
16	To 50 yards of curtain stuf	at 75		37	50
	32 ticking		50	16	
	42 cotton		25	10	50
				64	
<hr/>					
	Mr. George Jackson Dr.				
30	To 12 bushels of peas	at 1 25		15	
	16 malt	1 50		24	
	40 apples	1 30		52	
	10 $\frac{1}{2}$ potatoes	75		7	87 $\frac{1}{2}$
				98	87 $\frac{1}{2}$
<hr/>					
	Mr. Thomas Winthrop Dr.				
April 4	To 36 bushels of wheat	at 1 75		63	
	40 $\frac{1}{2}$ rye	1		40	50
	160 oats	1 20		192	
				295	50
<hr/>					
	Mr. Frederic Tudor Dr.				
12	To 3 cwt of sugar	at 18 per lb		60	48
	5 cheese	15		84	
	30 gal of porter	12 $\frac{1}{2}$		3	75
	63 ale	12		7	56
				155	79

Mr.

BOOK KEEPING.

83

1796		Mr. Peter Vinal Dr.		dol c	dol c
April 21	To	5 doz of pen knives	at	6	30
		10 copy books		87½	875
		6 ink stands		1 12½	675
					<hr/> 45 50
		Mr. William Winton Dr.			
25	To	100 doz of bottles	at	75	75
		3 wine glasses		1 50	4 50
		4 tumblers		1 50	6
		6 decanters		87½	5 25
					<hr/> 90 75
		Mrs. Elizabeth Gregory Dr.			
May 10	To	14 lb of hard soap	at	12½	1 75
		7 soft do		4	28
		3½ starch		25	87½
		3½ indigo		1 62½	5 68½
					<hr/> 8 59½
		Mr. Samuel Hobson Dr.			
14	To	2 cwt 12 lb of raisins	at	10 per lb	23 60
		3½ 10 do		12½	50 25
		5 rice		4	22 40
		28 lb cloves		1 20	33 60
					<hr/> 129 85
		Mr. John Norton Dr.			
23	To	5 grofs of brafs buttons	at	3 50	17 50
		2 white		3	6
		84 pairs of buckles		1 25	105
		24 trunk locks		12½	3
		12 chamber do		25	9
					<hr/> 140 50
		Mrs. Mary Ruffel Dr.			
31	To	2 doz knives and forks	at	3 75	7 50
		1 set of china			5
		18 china plates		50	9
					<hr/> 21 50

Mr.

1796	Mr. Charles Clarke Dr.					
			<i>dol c</i>		<i>dol c</i>	
June 1	To 37 gallons of brandy	at	2 25		83 25	
	46 barrels of flour		10 50		483	
	123 bushels of Indian corn		76		93 48	
	654 cwt of ship biscuit		3 30		2158 20	
					2817 93	
	Mrs. Margaret Limon Dr.					
6	To 19 yards of lace	at	2 75		52 25	
	84 pairs of silk stockings		3		252	
	144 cotton do		1 30		187 20	
					491 45	
	Mr. Peter Vinal Dr.					
8	To 120 copy books	at	12 $\frac{1}{2}$		15	
	60 Pike's Arithmetic		1 75		105	
	2350 quills		2 25 per <i>bun</i>		52 87 $\frac{1}{2}$	
	950 do		2 50 per <i>bun</i>		23 75	
					196 62 $\frac{1}{2}$	
	Miss Fanny Dawson Dr.					
15	To 14 yards of blue ribbon	at	12 $\frac{1}{2}$		1 75	
	21 white do		10		2 10	
	12 $\frac{1}{2}$ lace		1 25		15 62 $\frac{1}{2}$	
	24 lustring		1 25		30	
					49 47 $\frac{1}{2}$	
	Mr. Thomas Winton Dr.					
20	To 10 tons of hay	at	30		300	
	Mr. Thomas Winthrop Dr.					
July 5	To 2 pipes of wine	at	1 50 per <i>gal</i>		378	
	360 gallons of porter		60		216	
	3 tons of cheese		6 50 per <i>cwt</i>		390	
	4 cwt of bread		6 per <i>lb</i>		26 88	
					1010 88	

BOOK KEEPING.

85

1796		Mr. Thomas Marriot Dr.			
			<i>dol c</i>	<i>dol c</i>	
July 10	To	3450 lb of cotton at	25	862	50
		10 firkins of butter	18 per lb	100	80
		12 lb of nutmegs	75 per bx	144	
		13 bhd of rum	1 25 per gal	1023	75
				2131	5
		Mr. Frederic Tudor Dr.			
17	To	18 cwt of tobacco at	20 per lb	403	20
		20 hops	75 per lb	1680	
		22 tons of hay	4 25 per cwt	1870	
		99½ bushels of oats	1 25	124	37½
				4077	57½
		Mrs. Jane Mafon Dr.			
28	To	543 yards of linen at	75	407	25
		12 cwt of sugar	15 per lb	201	60
		5 rice	6 per lb	33	60
		234 lb of tea	1 80	421	20
				1063	65
		Mr. Benjamin Thompson Dr.			
Aug. 1	To	24 Ruffel's History of } at 2		48	
		Modern Europe			
		12 Paley's Philosophy	1 87½	22	50
		36 Paley's Evidences of } 1		36	
		Christianity			
		6 Nicholson's Chemical } 8 30		49	80
		Dictionary			
				156	30
		Mr. James White Dr.			
9	To	18 Blair's Sermons at	3 50	63	
		12 Porteus's do	3	36	
		24 Watfon's Theological } 10 50		252	
		Tracts			
		60 Watfon's Apology	50	30	
				381	

1796	Mr. Samuel Hall Dr.					
Aug. 14	To 40 doz	of picture books	at	1 10	dol c	dol c
	6	Clarke's Letters		6		48
	10	single sermons		1 50		36
						15
						99
Mr. Francis Nichols Dr.						
	To 10 doz	of Juvenile Trials	at	1 75		17 50
	5	Watson's Address		1 75		8 75
	9	Sunday Evening	}	3 50		31 50
		Lectures				
						57 75
Mr. James Vincent Dr.						
30	To 36	Wakefield's Horace	at	3 50		126
	48	Virgil		3 50		168
						294
Mr. Thomas Edwards Dr.						
Sept. 2	To 1 silver	} oz dwt gr wt 23 4	at	1 25 per oz		29
	bowl					
	12 silver plates	220 13 15		1 33½		294 24
	12 silver spoons	41 12 10		1 40		58 26
						381 50
Mr. Henry Foster Dr.						
3	To 40 chords	of wood	at	5 50		220
	5 chaldrons	of pit coal		9		45
	10 bus	of charcoal		25		2 50
						267 50
Mr. David Kemble Dr.						
7	To 260½ bus	of potatoes	at	45		117 22½
	576	turnips		50		288
	320	carrots		62½		200
						605 22½

Mr.

1796	Mr. George Robinson Dr.	dol	c	dol	c
Sept. 8	To 2839 doz of Lemons at	62½		1774	37½
	1234 do	25		308	50
	587 ropes of onions	50		293	50
				2376	37½
<hr/>					
	Mr. Arthur Young Dr.				
30	To 350 lb of fine wool at	30		105	
	234 coarse do	25		58	50
				163	50
<hr/>					
	Mr. Thomas Simson Dr.				
Oct. 1	To 6 doz pairs of scissars at	1	75	10	50
	7 of razors	6		42	
	10 silver spoons	36		360	
				412	50
<hr/>					
	Mrs. Martha Cabot Dr.				
2	To 12 fans at	75		9	
	6 sets of knots	62½		3	75
	2 fine laced tippets	6		12	
				24	75
<hr/>					
	Mr. Robert Davis Dr.				
10	To 4 reams of marble paper at	6		24	
	5 gilt do	8		40	
	12 post do	2	50	30	
				94	
<hr/>					
	Mr. Charles Cutler Dr.				
13	To 365 yards of canvass at	25		91	25
	230 lb of hemp	12½		28	75
	570 flax	20		114	
				234	
<hr/>					
	Mr. Job Orton Dr.				
30	To 126 gal of red port at	1	25	157	50
	252 claret	1	75	44	
				598	50

Mrs.

1796	Mrs. Susan Gray Dr.			dol c	dol c
Nov. 1	To 40 $\frac{1}{2}$ yds of ribbon	at	45	18	22 $\frac{1}{2}$
	30 damask	1	25	37	50
	42 $\frac{1}{2}$ lawn		50	21	25
				76	97 $\frac{1}{2}$
Mrs. Martha Cabot Dr.					
3	To 36 china plates	at	75	27	
	24 dishes	2	25	54	
				81	
Miss Sarah Smith Dr.					
10	To 15 $\frac{7}{8}$ yards of spriged } } muslin	at	3	47	62 $\frac{1}{2}$
	12 pieces of chintz	16		192	
				239	62 $\frac{1}{2}$
Mr. Charles Clarke Dr.					
14	To wheat, 7 qr 3 buf	at	1 50 per buf	88	50
	malt, 17 5	1	75	246	75
	hops, 56 lb		50	28	
				363	25
Mr. Charles Cutler Dr.					
17	To 50 lb of tallow candles	at	20	10	
	60 wax do		30	18	
	70 honey		15	10	50
				38	50
Mr. Thomas Simson Dr.					
20	To 180 pairs of steel } } buckles	at	2 50	450	
	240 silver do	7		1680	
				2130	
Mrs. Margaret Limon Dr.					
21	To 21 yards of silver ribbon	at	75	15	75
	11 $\frac{1}{2}$ fine lace	2	50	28	75
	17 Indian fans	1	25	21	25
				65	75

Mr.

1796

Mr. Job Orton Dr.

		<i>dol</i>	<i>c</i>	<i>dol</i>	<i>c</i>
Nov. 23	To 5 <i>bhd</i> of rum at 1 50 per gal	472	50		
	20 <i>bar</i> of porter 40 per gal	288			
	25 ale 45 per gal	405			
	126 gallons of vinegar 15	18	90		
		1184	40		

Mr. Thomas Edwards Dr.

25	To 10 silver watches at 25	250			
	5 gold do 60	300			
	6 Hadley's quadrants 15 50	93			
	12 achromatic telescopes 30	360			
		1003			

Mrs. Susan Gray Dr.

30	To 6 India shawls at 5	30			
	230 yards of painted paper 10	23			
	12 pairs of silk shoes 1 25	15			
	3 red morocco do 2	6			
		74			

Mr. Henry Foster Dr.

Dec. 1	To 20 tons of hay at 2 50 per <i>cwt</i>	1000			
	25 clover 3 50	1750			
	15 vetches 4	1200			
	6 straw 75	90			
		4040			

Mr. George Robinson Dr.

2	To 1000 <i>doz</i> of oranges at 50	500			
	10 <i>buf</i> of hazel nuts 2	20			
	150 apples 1 30	195			
	20 peaches 2 50	50			
		765			

Mr. Arthur Young Dr.

3	To 360 <i>lb</i> of beef at 12½	45			
	270 mutton 10	27			
	165 pork 9	1485			
	543 bread 7	38	1		
		124	86		

1796		Mr. Christopher Anderson Dr.			
Dec.	To	40½ cwt of tobacco	at	dol c 10	dol c 405
	4	10 do		12	120
					525
Mr. Christ. Anderson Dr.					
5	To	120 lb of tea	at	2	240
		150 coffee		1	150
					390
Mr. William Johnson Dr.					
6	To	1 bhd of rum	at	1 25 per gal	78 75
Mrs. Mary Ruffel Dr.					
7	To	4 looking glafs			8
		2 tea boards			7
					15
Mrs. Hannah Bulfinch Dr.					
8	To	112½ yards of holland	at	1 25	140 62½
		72 Irish linen		75	54
					194 62½
Mr. Simon Kirkland Dr.					
9	To	30 yards of nankin	at	50	15
		40 cassimere		2	80
					95
Mr. Thomas Lawfon Dr.					
20	To	a gold watch			100
		clock			30
					130
Mr. Richard Otis Dr.					
25	To	24 mahogany chairs	at	6 75	162
		18 common do		1 50	27
					189

L E D G E R.

ALPHABET. *

A J. Austin 1 C. Anderson 5	B J. Baker 1 H. Bulfinch 5	C C. Clarke 3 M. Cabot 4 C. Cutler 5
D F. Dawson 3 R. Davis 4	E T. Edwards 4	F H. Foster 4
G E. Gregory 2 S. Gray 5	H S. Hobson 1 S. Hall 3	J W. Johnson 1 G. Jackson 2 F. Jarvis 2
K D. Kemble 4 S. Kirkland 5	L M. Limon 3 T. Lawson 5	M T. Marriot 1 J. Mason 1
N J. Norton 3 F. Nichols 3	O J. Orton 5 R. Otis 5	P
Q	R M. Ruffel 1 G. Robinson 4	S T. Simson 4 S. Smith 5
T F. Tudor 2 B. Thompson 3	V P. Vinal 2 J. Vincent 3	W T. Winthrop 2 J. White 3 W. Winton 2
X	Y A. Young 4	Z

* The numbers refer to the pages of the ledger.

(1)

1796	Mr. James Austin Dr.	dol	c
Jan. 1	To sundries	76	50
March 9	To sundries	230	
		306	50
<hr/>			
	Mr. John Baker Dr.		
Jan. 3	To sundries	1306	25
Feb. 2	To sundries	126	77
		1433	2
<hr/>			
	Mrs. Mary Ruffel Dr.		
Jan. 4	To sundries	512	24½
May 31	To sundries	21	50
Dec. 7	To sundries	15	
		548	74½
<hr/>			
	Mr. William Johnson Dr.		
Jan. 10	To sundries	606	90
Dec. 6	To 1 bbl of rum	78	75
		685	65
<hr/>			
	Mr. Thomas Marriot Dr.		
Jan. 25	To sundries	387	22
July 10	To sundries	2131	5
		2518	28
<hr/>			
	Mrs. Jane Mafon Dr.		
Feb. 6	To sundries	577	81½
July 28	To sundries	1063	6
		1640	87½
<hr/>			
	Mr. Samuel Hobson Dr.		
Feb. 10	To sundries	1464	75
May 14	To sundries	129	85
		1594	60

By

BOOK KEEPING.

93

(1)

1796	Cr.	dol	c
Jan. 20	By cash in full	76	50
April 1	By cash in full	230	
		<u>306</u>	<u>50</u>
Jan. 3	By cash in full	1306	25
March 1	By sundries in full	126	77
		<u>1433</u>	<u>2</u>
Feb. 2	By a bill for	520	
May 31	By cash in full	28	74½
Dec. 20	By cash in full	15	
		<u>548</u>	<u>74½</u>
April 1	By a bill for	600	
Dec. 6	By cash in full	85	65
		<u>685</u>	<u>65</u>
Feb. 1	By cash in full	387	28
July 10	By a bill for	2000	
Dec. 1	By cash in full	131	5
		<u>2518</u>	<u>28</u>
Feb. 28	By cash in part	500	
July 18	By cash in full	1140	87½
		<u>1640</u>	<u>87½</u>
May 14	By cash in full	1594	60

I

By

(2)

1796		Mr. George Jackson Dr.	deb	cr
Feb. 20	To fundries		16958	25
March 30	To fundries		98	87½
			17057	12½
		Miss Fanny Jarvis Dr.		
Feb. 24	To fundries		17	62½
March 16	To fundries		64	
			81	62½
		Mrs. Elizabeth Gregory Dr.		
March 1	To fundries		134	93½
May 10	To fundries		8	59½
			143	53
		Mr. Thomas Winthrop Dr.		
April 4	To fundries		295	50
July 5	To fundries		1010	88
			1306	38
		Mr. Frederic Tudor Dr.		
April 12	To fundries		155	79
July 17	To fundries		4077	57½
			4233	36½
		Mr. Peter Vinal Dr.		
April 21	To fundries		45	50
June 8	To fundries		196	62½
			241	12½
		Mr. William Winton Dr.		
April 25	To fundries		90	75
June 20	To 10 tons of hay		300	
			390	75

Mr.

BOOK KEEPING.

95

(2)

Cr.

1796		dbl	c
March 30	By cash in full	17057	12½
April 1	By cash in full	17	62½
May 1	By cash in full	64	
		81	62½
June 1	By cash in full	143	53
May 1	By a bill for	200	
July 5	By cash in full	1106	38
		1306	38
April 12	By cash in part	100	
July 30	By cash in full	4133	36½
		4233	36½
June 8	By cash in full	242	12½
April 25	By cash in full	90	75
June 20	By cash in full	300	
		390	75

Mrs.

(3)

1796	Mr. John Norton Dr.	dol	c
May 23	To fundries	140	50
	Mr. Charles Clarke Dr.		
June 1	To fundries	2817	93
Nov. 14	To fundries	363	25
		3181	18
	Mrs. Margaret Limon Dr.		
June 6	To fundries	491	45
Nov. 21	To fundries	65	75
		557	20
	Miss Fanny Dawson Dr.		
June 15	To fundries	49	47½
	Mr. Benjamin Thompson Dr.		
Aug. 1	To fundries	156	30
	Mr. James White Dr.		
Aug. 9	To fundries	381	
	Mr. Samuel Hall Dr.		
Aug. 14	To fundries	99	
	Mr. Francis Nichols Dr.		
Aug. 24	To fundries	57	75
	Mr. James Vincent Dr.		
Aug. 30	To fundries	294	

Mr.

(3)

1796		Cr.	dol	c
May 25	By a bill for		140	50
June 1	By cash in part		2000	
Dec. 1	By cash in full		1181	18
			3181	18
Nov. 21	By a bank note		400	
Dec. 1	By cash in full		157	20
			557	20
June 15	By cash in full		49	47½
Sept. 1	By cash in full		156	30
Aug. 9	By cash in full		381	
Aug. 14	By cash in full		99	
Aug. 24	By fundries		57	75
Sept. 1	By cash in full		294	50

(4)

1796.	Mr. Thomas Edwards Dr.	dol	c
Sept. 2	To fundries	381	50
Nov. 25	To fundries	1003	
		1384	50
	Mr. Henry Foster Dr.		
Sept. 3	To fundries	267	50
Dec. 1	To fundries	4040	
		4307	50
	Mr. David Kemble Dr.		
Sept. 7	To fundries	605	22½
	Mr. George Robinson Dr.		
Sept. 8	To fundries	2376	37½
Dec. 2	To fundries	765	
		3141	37½
	Mr. Arthur Young Dr.		
Sept. 30	To fundries	163	50
Dec. 3	To fundries	124	86
		288	36
	Mr. Thomas Simson Dr.		
Oct. 1	To fundries	412	50
Nov. 20	To fundries	2130	
		2542	50
	Mrs. Martha Cabot Dr.		
Oct. 2	To fundries	24	75
Nov. 3	To fundries	81	
		105	75
	Mr. Robert Davis Dr.		
Oct. 10	To fundries	94	

BOOK KEEPING.

99

(4)
Cr.

1796			dol	c
Nov. 25	By a bill for		400	
	By account at folio 6		984	50
			1384	50
Dec. 1	By cash in full		4307	50
Dec. 31	By cash in full		605	22½
Sept. 8	By a bill for		2000	
Dec. 31	By cash in full		1141	37½
			3141	37½
Nov. 1	By cash in full		163	50
	By account at fol. 6		124	86
			288	36
Oct. 1	By a bill for		400	
Dec. 1	By cash in full		2142	50
			2542	50
Nov. 3	By cash in full		105	75
	By account at fol. 6		94	

Mr.

(5)

1796	Mr. Charles Cutler Dr.	dol	c
Oct. 13	To fundries	234	
Nov. 17	To fundries	38	50
		272	50
	Mr. Job Orton Dr.		
Oct. 20	To fundries	598	50
Nov. 23	To fundries	1184	40
		1782	90
	Mrs. Susan Gray Dr.		
Nov. 1	To fundries	76	97½
Nov. 30	To fundries	74	
		150	97½
	Miss Sarah Smith Dr.		
Nov. 10	To fundries	239	62½
	Mr. Christ. Anderson Dr.		
Dec. 4	To fundries	525	
Dec. 5	To fundries	390	
		915	
	Mrs. Hannah Bulfinch Dr.		
Dec. 8	To fundries	194	62½
	Mr. Simon Kirkland Dr.		
Dec. 9	To fundries	95	
	Mr. Thomas Lawfon Dr.		
Dec. 20	To fundries	130	
	Mr. Richard Otis Dr.		
Dec. 25	To fundries	189	

BOOK KEEPING.

101

(5)

Cr.

1796		dol	c
Nov. 17	By cash in part	200	
Dec. 1	By cash in full	72	50
		272	50
Oct. 20	By cash in part	500	
Nov. 30	By cash in part	1000	
	By account at fol. 6	282	90
		1782	90
Nov. 1	By cash in full	76	97½
	By account at fol. 6	74	
		150	97½
Dec. 31	By cash in full	239	62½
Dec. 4	By cash in full	525	
	By account at fol. 6	390	
		915	
Dec. 20	By cash in full	194	62½
Dec. 9	By cash in full	95	
	By account at fol. 6	130	
Dec. 25	By cash in full	189	

At the end of every year tradesmen take an account of stock and balance their accounts, in order to know the state of their trade. In this case they transfer their book debts to a new ledger, or to new pages of the same ledger, and draw out a balance account at the end of the old ledger, as is done below.

Balance Dr.

		dol	c
1796	Mr. Thomas Edwards	984	50
	Mr. Arthur Young	124	86
	Mr. Robert Davis	94	
	Mr. Job Orton	282	90
	Mrs. Susan Gray	74	
	Mr. Christ. Anderson	390	11
	Mr. Thomas Lawfon	130	
		<u>2080</u>	<u>16</u>

A C. Anderson	B	C	D R. Davis
E T. Edwards	F	G S. Gray	H
I	K	L T. Lawfon	M
N	O J. Orton	P	Q
R	S	T	V
W	X	Y A. Young	Z

Mr.

(6)

1797	Mr. Thomas Edwards Dr. To account at fol. 4	984 50
	Mr. Arthur Young Dr. To account at fol. 4	124 86
	Mr. Robert Davis Dr. To account at fol. 4	94
	Mr. Job Orton Dr. To account at fol. 5	282 90
	Mrs. Susan Gray Dr. To account at fol. 5	74
	Mr. Christ. Anderson Dr. To account at fol. 5	390
	Mr. Thomas Lawfon Dr. To account at fol. 5	130

THE END.

1870	To balance forward	
1871	By balance forward	
1872	To balance forward	
1873	By balance forward	
1874	To balance forward	
1875	By balance forward	
1876	To balance forward	
1877	By balance forward	
1878	To balance forward	
1879	By balance forward	
1880	To balance forward	
1881	By balance forward	
1882	To balance forward	
1883	By balance forward	
1884	To balance forward	
1885	By balance forward	
1886	To balance forward	
1887	By balance forward	
1888	To balance forward	
1889	By balance forward	
1890	To balance forward	
1891	By balance forward	
1892	To balance forward	
1893	By balance forward	
1894	To balance forward	
1895	By balance forward	
1896	To balance forward	
1897	By balance forward	
1898	To balance forward	
1899	By balance forward	
1900	To balance forward	



